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ANIMAL KINGDOM

NEW YORK ZOOLOGICAL SOCIETY

VOLUME LII

JANUARY TO DECEMBER, 1949

NUMBERS 1–6

SMITHSONIAN INSTITUTION
U. S. NATIONAL MUSEUM

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FEB 24 1949
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THE MAGAZINE OF THE NEW YORK ZOOLOGICAL SOCIETY

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Wilderness Comes to Gotham

THERE IS NOTHING really surprising about the fact that the Annual Meetings of the Society play to "over-flow" houses. This year more than three thousand members and guests attended the two evening meetings with "standing room only" for late-comers. The truth of the matter is, we are one and all thirsty for contacts with the natural world. In a very real sense, the work of the Society acts as an antidote to the over-mechanization of our lives. Without pressing the point, it is to many people far more than that. To them the observation and study of animal life in its myriad forms is a lasting, inspirational experience. There is a revelation of form, movement, color and sound — the end-results of timeless processes of adaptation and evolution. By some hidden channel there comes the sense of the unity of all life, revealed either through the processes of scientific inquiry or through the glimpse of a fawn standing beneath a towering redwood alive since the days of Christ; through the stately movement of an antlered head, the azure blue of a calliste, or even through hearing the "mad" sound of a Duck-billed Platypus or the ironic laugh of a Kookaburra. An "overflow" house? Why not?

Fairfield Osborn

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Little Brown Bat in Flight . . . . . *Sam Dunton* COVER
(Photograph taken at 1/5,000th of a second)
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One of the great rarities of Africa, and a prize of the collection Charles Cordier is making for the Society, is the Congo Peacock (Afropavo). This is a young male, not yet in the full beauty of its iridescent plumage, in a native-built cage at Cordier's base camp in the Belgian Congo.

Further Adventures of Charles Cordier

Charles Cordier, the Zoological Society's animal collector, and Mrs. Cordier, went to the Belgian Congo in the fall of 1947 in search of the great animal rarities of central Africa for the Zoological Park's collections. Some of their adventures, including the accident that disabled Charles for many months, were recounted in the Society's Congo Newsletters in the winter and spring of 1948. During this past summer and fall Charles was sufficiently recovered to resume his quest for animals, and this letter to General Curator Lee S. Crandall recounts his adventures on an excursion that, while disappointing in its concrete results, typifies the difficulties of animal collecting in Africa.

We now expect that Charles will complete his collection and return to New York early in the spring, probably April or May, when the weather makes transportation by ship possible for tropical animals.

Black Guineafowl Camp
Around October 21, 1948

We left with the truck on October 6th, chockful with empty cages to meet all possibilities. The first objective was to be the mate for Doreen [the Zoo's Bongo], then females for the Water Chevrotains, Afropavos [the Congo Peacock] and Black Guineafowls that I have males of already. Now events have inverted the list. I have, so far, three Black Guineas, one Blue-headed Ground Dove.

I had with me Auguste, my carpenter, who knows Swahili and Lingala, also a police Corporal lent to me by the Kisubi Chef de Secteur [a native official]. First objective we wanted to reach was Weko, one hour's fast drive true north of Yangambi, then from there the natives would tell us where to go to, or so we thought.

The reason we chose Weko was twofold. First M. de Medina [the official Government hunter of Gorillas and Okapis] had recommended the place for Bongos and Afropavos. Then the present chauffeur whom I left with Emy [Mrs. Cordier] comes from this region and gave us a glowing account of its possibilities. We made for Weko with high hopes and got there early in the afternoon, enroute having acquired a Government order for the Weko Chef de Secteur to supply fifty men to hunt the Bongo.

They are of the Turumbu tribe – one of the most backward, on a level with, or lower, than the Bakumu of Bongena and Lubutu memory. They are not allowed to carry spears, for valid reasons, I could see. The Chef de Secteur, a former Sergeant-major from Lisala, was finally found, and I questioned him closely. Now, where could we find Bongos in numbers, not too far from the highway, and would he get us the fifty men with nets, each man to carry provisions? He said Yalibutu, E.N.E. of Weko, would be the place to find the Bongos, near the headwaters of the Lubilu River, four hours' walk from the village. As for the men, we should not worry; he would get us seventy, not merely fifty. Then we duly

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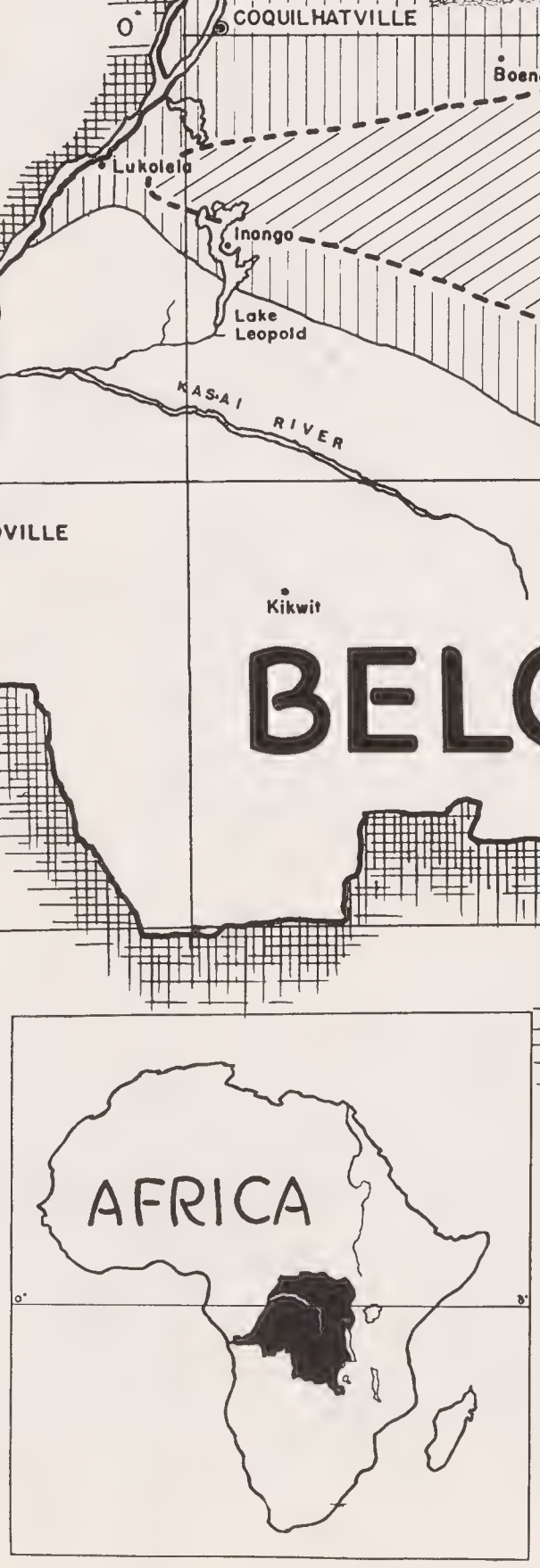
NEW YORK ZOOLOGICAL SOCIETY'S

BELGIAN CONGO EXPEDITION

1947 - 1949



BELGIAN CONGO



KEY

- THE GREAT RAINFOREST
- CONGO PEACOCK REGION
- MOUNTAIN GORILLA COUNTRY
- ---- TENTATIVE LIMIT OF HABITAT

The travels of Charles Cordier can be followed by reference to this map, for many of the localities mentioned in this article are indicated in the area above Stanleyville. But — as Charles's letter reveals only too clearly — it is one thing to travel on a map, and quite another to do the actual slogging through the hot, damp Congo jungle!

impressed it upon him he would get one thousand francs if we should be successful. He beamed, we made off for Yalibutu, some 20 to 25 kilometers away. There the rest-house was invaded by weeds and the great Sultani [village chief] in sun helmet and well-pressed clothes came forward, but he did not strike me as active or helpful. Would there be Bongo on the Lubilu River and could they be netted? Yes, Bongos are there but they could not be netted. They could get them in steel-cable foot slings, though, undamaged, a matter of three days. They would have to have many helpers to hold down the animal. So we mapped our campaign. We would take in balsa wood boards cut at the village to make a crate near where the animal would be trapped, as no cutting of sticks was allowed on account of this being a forestry reserve. The crate would then be carried out along a path which was very good, so they said.

The following day 21 men turned up, sent by the Chef de Secteur, all in their Sunday best, without nets or provisions. They were not told that they would need these, they asserted. So we sent them back to get these things. The following day they were back, ready this time, and with them a batch of other recruits, also in their best clothes and with bare hands. These in turn had to go fetch their food and nets. On the third day, in the late afternoon, we finally had the fifty men (not seventy!) with hopes of getting them off to the Bongo lair on the following morning. For the Bongo hunt their nets would be of no avail, being only two feet high and good, at best, for Blue Duikers, Water Chevrotains, Afropavos and Black Guineafowls, which also are found in quantities there — so the natives said. In the meantime, I had rushed down to Yangambi to see the Chief of the Forest Reserve, as the men of Yalibutu said they didn't dare enter, two of them having been jailed once for being found there with a shelter made of leaves and sticks cut on the spot. I could find nobody at Yangambi to give the go-ahead signal, the chief being away. So I left a written message for the Forest Reserve Chief.

Back at Yalibutu I felt a glow of satisfaction at the prospect of going in the following day. However, the feeling was short-lived because the men who were supposed to put out the foot slings for the Bongos came around to tell us they had only eight of the necessary forty or so. It would have been easy to buy these at Yangambi, but they did not state their want before I went there. Fortunately, a peddler on a bicycle came by and I bought some wire. Late that afternoon two Forestry Reserve officials came along to see me. I appreciated that, of course. They could see no reason why one should not hunt in the reserve, provided I put up tents for my men. One official suggested it might be well-nigh impossible to get a big cage out via the trail. The

On the way to hunt the Congo Peacock, the Society's collector traveled down the Aruwimi River with two native dugouts loaded with his equipment. These dugouts are hollowed-out tree trunks, often more than 30 feet long.





Balsa wood crates were hand-hewn with machetes and the light, smooth boards bound together with "bush rope"—thus making extremely stout, but light-weight, small animal cages.

Comparative luxury is represented by this partial view of the Cordier's base camp at Kisubi, across the Congo River from Stanleyville. These are animal sheds and quarters for houseboys.





Quite different from the permanent installation at Kisubi is Charles' camp in Congo Peacock country, where tents serve as shelter from rain. Elephant bones were found in clearing this site.

In the hunting camp of the Bamanga tribesmen, Charles pitched his tent in the background. The hunters slept in the structures on stilts—scarcely a safe perch if an elephant came along!





The native method of capturing the Giant Plantain-eater—one of the most beautiful birds of the Congo—is to set snares like these in leech-infested swamps, where the birds come to feed.

This is one method of capturing Bongos that didn't work. This stick-and-vine fence was built around a large open place where the antelopes came to feed. They trampled the fence down.





Charles Cordier holds a Giant Pangolin, or Scaly Anteater, for inspection. This particular animal was caught in a wire noose, but some are dug out of their burrows. Mrs. Cordier had the difficult job of inducing the animal to take milk, meat and raw egg instead of its termite diet.

natives then concurred, retracting what they had said about a wide, unobstructed trail. The official proposed I should go in with dugouts, up the Lubilu River, and take the animals out the "easy way." So I rushed down to Yangambi again to arrange for transportation for myself up the river, but instructed Auguste, the carpenter, to go in with the men by the trail, as planned. It took one day to find dugouts, three days to get rowed and pushed up by poles to Auguste's camp. I had to sit on a steel case and slap horseflies all day. It was no pleasure. Neither on the way up nor down did I see any animals, except one band of Black Guerezas and another of Red Colobus Monkeys. Of Giant Plantain Eaters I met one flock of five and another of four, also a few pairs of Scarlet-throated Bee Eaters, three Kingfishers, two Doves and a swarm of Fruit Pigeons at Auguste's camp. The emptiness of the forest is very striking and before and since I am asking myself what there is to collect besides the ground birds.

Auguste had been in camp four days and one look at his face was enough for me to realize that our hopes were dashed to the ground. There were no signs of Bongos whatsoever. Now the natives explained that this place had been wonderful in times past. One old chap showed Auguste the spots where he had trapped five Bongos, another three. Perhaps it was the wrong time of the year? . . . Of the mound of cages we had the men bring in, three contained two buck Water Chevrotains and one doe – nothing else. Plenty of Blue Duikers had been netted for the men to eat. There were no signs of Afropavos or Black Guineafowls either. Hard pressed on that score, the men admitted there weren't any in these parts, south of the Weko-Bengamisa highway – only on the opposite side of the road at a day's march of eight hours. They offered to go there and put out foot slings as soon as we returned to the village.

None of these men ventured this information before going in the wrong direction with all these men and equipment, neither did they suggest

(*Continued on Page* 28)

When Winter Comes to Jackson Hole Wildlife Park

By JAMES R. SIMON



A SEVERE Rocky Mountain winter such as the present winter threatens to be, vastly complicates the problem of caring for the large mammals in Jackson Hole. Simply stated, the problem is to aid the elk and deer to survive by providing food during severe weather until spring thaws uncover vegetation that the animals can easily reach. Today in the Jackson Hole country there are but few elk which spend the winter in isolation except during the mildest of winter seasons; if they do so it is likely that they have been caught high in the hills before they could escape through the deep snow. They do not winter in the highlands by choice.

Much as we may dislike to face the fact, most of the elk of Jackson Hole are semi-domesticated, being fed as cattle are fed in bad years of heavy snowfall or in years of long-continued winter. Before winter feeding by man became established there were very heavy losses from starvation during the winters of 1882, 1888 and 1891. After feeding was begun as a more or less regular relief measure there were losses in 1910, 1911, 1920 and 1943. These later losses occurred when feed was unobtainable or when the elk became too concentrated over a long period and were decimated by disease. There are those today who say that artificial feeding cannot be accomplished. The criterion of success, of course, is whether or not the elk survive a winter of artificial feeding and become potential breeding stock for another year. This sort of care applies mostly to elk, to deer in a lesser degree, and to moose and Rocky Mountain sheep, even less. However, the sheep and moose exist in such small numbers that, when feeding is necessary, it is not the enormous task that caring for elk and deer proves to be. Even for moose and sheep winter is a critical period. What was done as early as 1907 as a matter of dire necessity, is done today as a matter of course; that is, regular feeding of the elk on State or Federal feed grounds even during mild winters. This situation is not generally known except by those handling the animals or by interested sportsmen and certainly it is not known by the casual summer visitor who sees the wild game on beautiful and amply productive summer range. The situation which requires winter feeding was brought about by a combination of events, all interrelated, which forced the elk to overuse of winter range in Jackson Hole. First, in the series of events affecting the Jackson Hole elk herd (and other herds of elk also) was their exclusion from the normal winter range at lower altitudes through the development of ranches and farms. Elk which usually drifted out of Jackson Hole southward and eastward to winter on the Little Colorado and Red Deserts – regions kept nearly bare of snow by high winds, – reacted to human



A sled laden with hay has been dragged onto this cold and wind-swept flat and some of the wintering animals in the Wildlife Park have gathered to feed. In this scene are two elk, three bison, a pronghorn antelope, a moose, and two mule deer—all familiar to summer visitors.

invasion of their migration routes as if complete barriers had been built across their paths. Likewise, the Northern Yellowstone herd which was accustomed to drifting down the Yellowstone River valley northward into Montana, has found its route almost blocked. The effect of ranches across their paths was simply to turn the elk back for a longer period until the only available winter range suffered extreme overuse. When overuse became more intensive – as it would as long as the hungry game animals remained, – the need for feeding became greater.

At first, emergency feeding did not impress the early operators as being habit-forming in the elk. This was learned later. Now it is expected that many elk will head for the "ancestral" feed grounds as soon as weather becomes bad. The largest feed grounds in Jackson Hole is the Federal Elk Refuge established as a result of popular demand. Its primary purpose is to prevent starvation by concentrating and feeding the elk; secondarily it tends to prevent haystack-raiding. In more recent years a fence, built along the south and west sides, has further helped the rancher against raiding elk. During the winter the refuge, which is immediately adjacent to the town of Jackson, cares for approximately half of Jackson Hole's 15,000 elk. It may not be the solution, but if elk are maintained in any numbers in the mountain ranges surrounding Jackson Hole, winter feeding is the only answer until the whole concept of managing a large herd of elk is revised and this concept must include allowance for larger, more productive winter ranges used by proportionately fewer elk. It is natural for any game animal to lose weight in the winter, but

when starvation can be prevented by artificial feeding and when no other method is immediately practical, feeding has proved its values. There are, of course, many problems connected with the feeding of semi-wild game, few of which have been solved by research. The general practice is to feed as one would feed domestic stock except that wild animals are fed much less than domestic stock where condition has obvious dollar value.

This, in brief, is the reason why elk in such large numbers have been so dependent on winter feeding for forty years. It would be ironical this year, particularly, to suffer a heavy winter loss of the wildlife when the facilities of the Fish and Wildlife Service and the State have never been more adequate for feeding, and when the kill during the past hunting season was purposely kept low to recover from heavy hunter kills during some of the past few years.

Anything can happen with such deep snows coming as early as they did this year, – December 15, 1948. Some elk are already stranded and cannot reach the established feed grounds. Attempts will be made by the State Game and Fish Department to locate some of these stranded animals and if their haunts are accessible by snowplane or airplane, hay or concentrate will be taken to them. A chinook or thaw with subsequent freezing would be disastrous as it would form crust impossible for the game to travel or to dig through to the forage beneath. More snow in quantity would be equally disastrous to isolated bands of elk and deer. Hence the game-conscious westerner is at present very much concerned.

As the winter increases in severity there is more and more damage by the elk to the property of ranchers, particularly to hay in stacks. Although there is a real attempt to fence the stacks against marauders, there is still loss and much time of game wardens is spent in elk drives, or herding the elk where they can do minimum damage.

It is fascinating to compare the elk and the

Elk can be, and often are, completely snowbound, for they are unable to travel well in deep snows that offer little obstacle to moose, for example. These two bull elk in the Wildlife Park have just about reached the stalling point, and will have to be provided with hay rations.



moose, both members of the deer family and as different as cousins can be. The moose can subsist in the winter almost entirely on willows and balsam fir and other forms of high browse. These are strictly emergency feeds for elk. Moose are rarely snowbound and, if forced to it, they can range widely in deep snow. In contrast, elk can be and often are snowbound. Snow of a depth that requires an elk to buck and lunge in desperate effort offers no great difficulty to a moose. Elk, the bane of the rancher resident because of haystack depredations, has no competition in this activity from the moose which seems to be just learning the nutritive value of well-cured hay. And when a moose is attracted to a stack he eats with care and there is a minimum of waste while the elk wastes, through trampling and fouling, much more than is consumed. There are nearly twenty elk to each moose in the area. Ironically, in the whole countryside there is more than enough food for many times the wildlife but it cannot be reached when the snow is deep. The most common complaint against the moose during the winter comes from the old trappers and those traveling afoot through the snow, "They bust up my snowshoe trails!" Perhaps in an effort to save strength for deeper snow ahead a moose will follow a trail through the snow. To the automobile traveler on cleared snow roads the moose is a real hazard. When snow is piled high along the highways and moose wander on to them, the driver is faced with running the animal for miles or with forcing his way around — the former very hard on the moose and the latter dangerous to both moose and driver.

The one hundred animals kept at the Jackson Hole Wildlife Park must be fed four or five months of the year, depending on the length of the season and the natural foods available. Winter feeding here is similar to that at the State or Federal feed grounds. For seven months, of course, there are natural grasses and browse in abundance. For five "winter" months the animals are able to obtain small quantities of browse, but their main food is hay and various forms of concentrated stock feed. Hay and concentrate are kept in a large hayshed adjacent to the feed grounds in the Park. This area is near a spring which flows year-round and is accessible to those animals wanting water in addition to the snow they normally eat. The elk eat an average of about eight pounds of hay each day. The buffalo eat more than this and the antelope and deer eat less. A ration of concentrate, cottonseed or soybean cake, is fed occasionally. The moose are more independent of artificial feed because they find natural browse within the Park confines even in winter. Considerably more is fed during the periods of bitter cold weather, temperatures as low as —30°F. for days at a time with occasional dips to —40°F. Fortunately there is no problem of wind; considerable protection is afforded by the lodgepole pine forest.

Additional hay is kept at the residence area of the Jackson Hole Wildlife Park, a distance of 1½ miles from the Park feed grounds. When the going is easy, hay is delivered from the residence area by team and sled to the animals which in a very short time seem to learn the feeding hour and more often than not, are waiting in groups around the enclosure. During extremely difficult weather bales of hay or sacks of concentrate are hauled from the Park hayshed by means of a toboggan, hand-drawn, for a short distance to the feed grounds. Buffalo are definitely the dominant animals on the feed grounds. Elk are next in aggressiveness. To prevent too much interference the hay must be spread widely so that all will get a share. Further to balance this situation in which the buffalo dominate the elk, concentrate is spread on hard-packed snow after the first hay is scattered. Elk relish the protein-charged stock feed much more than the buffalo, hence get a greater share.

The large mountain coyotes, abundant in the region, are always a menace to the smaller animals, especially as the winter season progresses and the carrion resulting from the hunting season becomes scant.

The Wildlife Park animals are fed early in the year, before the "going gets tough" so that they are in good condition throughout the winter. Snowshoe patrols are made around the Park twice weekly to remove fallen trees or branches from the fence. It is doubtful if any of the animals would leave the vicinity of the feed grounds even though a break in the fence were discovered.

Wintering wild animals is a gamble, the vagaries of the weather against the stored rations until "the coming of the thaw" decides the bet.



The little Long-eared Hedgehog from Cyprus actually lives up to its reputation. "As prickly as a hedgehog" has a very real meaning to anyone who has seen this fellow in our Small Mammal House, curled in a tight ball.

Newcomers and Old Friends in the Zoo

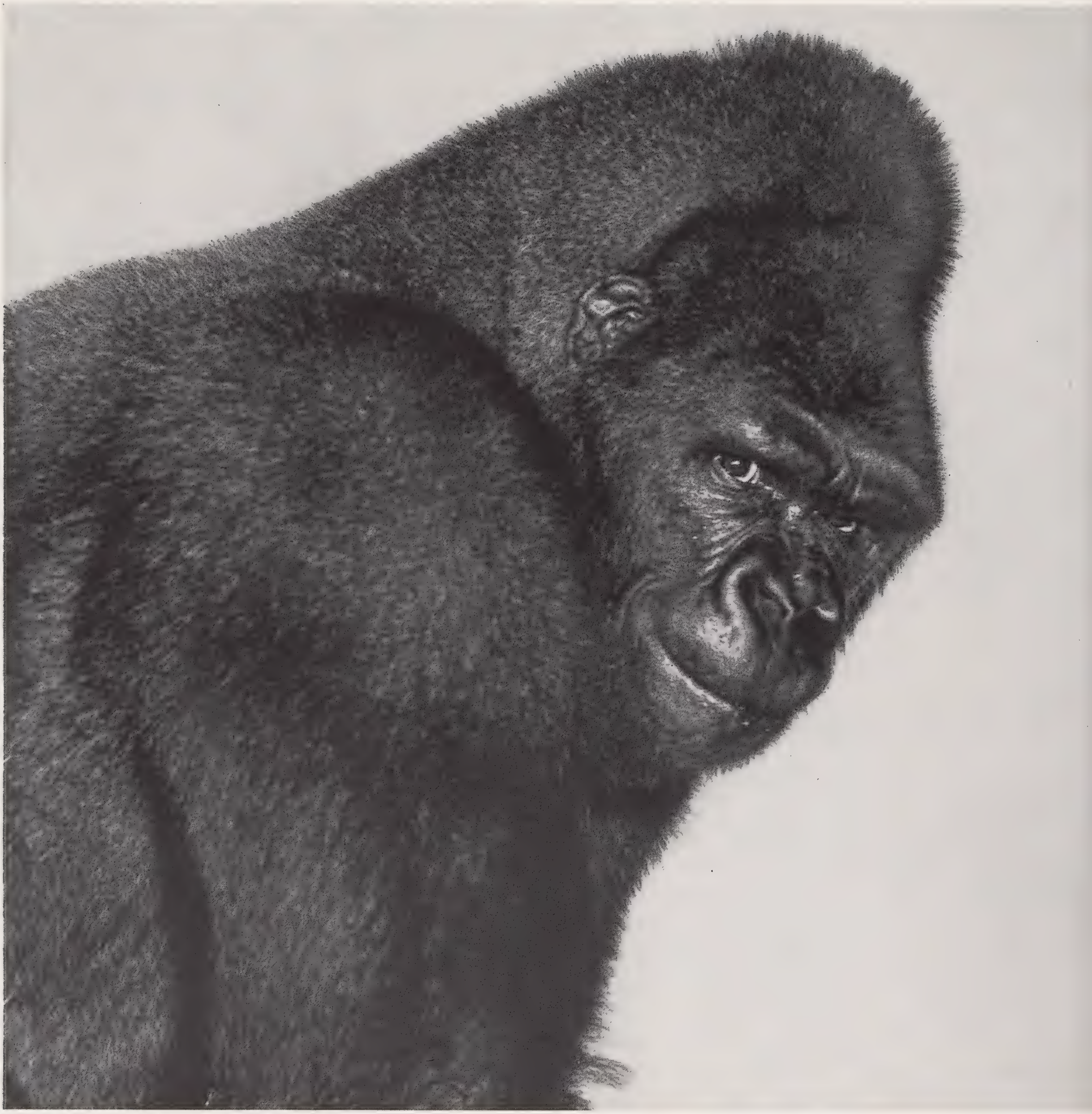
Photographs by Sam Dunton

The West Indian Land Crab is an interesting new exhibit in the Reptile House. About three and a half inches broad, blue-gray in color, it is showy and attractive. Females of this crab swarm to the seashore at certain seasons, where the waves wash off the eggs attached to their abdomens. About two weeks later the young crabs come out and move inland. The crab is a scavenger.





These chocolate-brown catfishes are something of a mystery. During the World War, the New York Aquarium imported large numbers of Electric Eels from the upper reaches of the Amazon for use in war research. These catfishes (then babies, only about an inch long) were brought along as eel food. Now they are about 10 inches long. They may turn out to be a new species.



This is Makoko, the Zoological Society's magnificent male lowland Gorilla, at the age of about eleven years. Makoko and Oka, the female (see opposite page) came to us on September 7, 1941, when they were estimated to be three and a half and two and a half years old, respectively. Both came from French Equatorial Africa. Makoko weighed 28 pounds on arrival, and now weighs 378 pounds—and still growing.



Oka is gentle and friendly, in distinction of Makoko who is friendly but rough; Keeper Reilley often plays with Oka, and she and Makoko play together every day. When Oka first arrived she weighed only 20 pounds but now she tips the scales at 266 pounds. Previous to the acquisition of these two, we have had three other Gorillas. All were lowland species. Gorillas have longevity records of more than 20 years.

Mid-winter days on Lion Island find visitors to the Zoological Park in winter overcoats, but the lions happily curled up in the sunshine and apparently not missing the heat of the African veldt. As a matter of fact, these three lions are captivity-bred and would not feel at home in Africa. They were purchased from a dealer in 1940 for exhibition on Lion Island. All are males.





That ear-piercing "Clang!" visitors to the Bird House are likely to hear proceeds from the Bare-throated Bellbird of southeastern Brazil. This is the first specimen we have exhibited in several years. A forest bird, it was taken from the nest by Indians and hand-reared, so that it is quite tame. There are four species of Bellbirds and we have two — the Three-wattled being the other.

That Curious Marsupial, the Cuscus

By DAVID FLEAY

As every naturalist knows, there are no monkeys in the jungles of New Guinea and Queensland. What, then, are the creatures that are often mistaken for monkeys and reported in non-scientific circles as such?

The answer, of course, is cuscuses, which are almost as little known to Australians as they are to zoo-goers in other parts of the world. They may vaguely resemble monkeys to some observers but they are really brightly-colored, woolly-furred, baboon-faced and comparatively sluggish marsupials – peculiar tropical members of the possum family. Broadly distributed from north Queensland through New Guinea into neighboring islands as far north as the equator, they are the original phalangers which gave the possum family its inclusive name of Phalangeridae.

From the point of view of activity, one might call them the most sloth-like of the marsupials. However, they certainly do not permit algae to grow in their fur, as was the case with some Two-toed Sloths I nursed on shipboard from Balboa to New York in 1947 while bringing the Duck-billed Platypuses to the New York Zoological Society.

The cuscus is a creature of the night. By day it sleeps "balled up" in the branches of jungle trees, the strongly prehensile tail rolled into as neat a ring as that of a millipede in its protective attitude. It is a heavy and powerfully-built animal, slow-moving but willing and able to bite viciously – not from sheer mateyness and curiosity as does one of its arboreal co-marsupials, Matschie's Tree Kangaroo, but with intent to teach its annoyer a lesson. Like the Koala it exhibits extreme toughness and tenacity of life in its own environment, feeding on its natural food, but as a rule it does not thrive in captivity. It is for this reason that it is comparatively little known to Australians in general.

I heard the natives around Madang, Alexishafen and other northern points of New Guinea referring to a cuscus I had as "Karpul," but that appears to be a somewhat loose term used to designate almost any wild animal. Actually there are at least sixteen species of cuscuses – only one being found in Australia, where it is confined to North Queensland, and the one of which I write particularly here is the New Guinea Spotted Cuscus (*Spilocuscus maculatus*), a male example of which may be three and a half feet in total length and as big as a large cat. So short are the ears of these animals that they do not project beyond the tough, extraordinarily thick, woolly fur which is an all-weather protection. It is this rounded, earless appearance, coupled with the yellow-rimmed protruding eyes and bright yellow nose, that is responsible for the cuscus's monkey-like face, and makes him altogether a most extraordinary creature to gaze upon. Another remarkable feature of both the New Guinea Spotted Cuscus and the related Queensland species is that, with the exception of those of the Waigiu Island locality, the females are not spotted, but are generally dark gray with sharply defined white under sides. At a casual glance one might quite pardonably assume that here was a different species altogether. The female's pouch is similar to that of the Ringtailed Possum in containing four mammae, and it is said that

a female is rarely captured or killed without having at least one baby in the pouch.

In July, 1939, I picked up a nice young male of the New Guinea Spotted Cuscus near Port Moresby. Then about the size of a Ringtailed Possum, this youngster was resplendent in a creamy white coat, decked out uniformly and plentifully over the whole of his upper surface in dime-sized black spots. "Pong," as he was christened, was exceptional in taking kindly to a captive state, and he is still hale and hearty. He provided notes of great interest on development, for, entering upon his second year of life, he had not only attained a size and weight equivalent to that of a Mountain Possum (*Trichosurus caninus*), but his color scheme gradually changed out of all recognition. The black dime-sized spots disappeared, being replaced by irregular gray patches on rump and thighs, with gray hind feet and legs. As the years went on Pong grew into a grand cuscus indeed, with a further dwindling of color. The latter half of his strong tail was bare and yellow and covered with rasp-like scales, while his yellow-skinned face and handsome fur made him an outstanding exhibit. In case there are any doubts as to the suitability of his name (which is Australian for a bad odor), it can be asserted that no one who has had close acquaintance with an adult male cuscus is ever likely to forget it. Should one handle him, no matter how gently and scientifically, the cuscus sees to that! My only personal experience with the redoubtable North American skunks has been confined to deodorized individuals, but those in going order must indeed be potent to exceed the cling-

The bare, yellow tail-tip of the New Guinea Spotted Cuscus is covered with scales, and has strong grasping powers, as this picture indicates. This is Pong, the author's specimen.



ing, penetrating and indescribably vile aroma of the cuscus.

Cuscus could still be smelled in the native galley of the ill fated steamer *Macdhui* for a considerable time after the southerly voyage on which I brought six of the animals to Sydney. My two good suits were almost useless for further wear after contact with cuscuses on that voyage – yet they were twice thoroughly cleaned before people ceased moving surreptitiously from my vicinity whenever I visited the movies.

Odor notwithstanding, natives relish cuscus flesh. They catch their victims with ease, owing to their slow movements in the trees, and then set to work with primitive directness, unhampered by any susceptibilities, to break their victim's legs. By this means escape of the animal and deterioration of its flesh are prevented, until such time as it is needed for cooking.

A quarrel or argument of any kind between cuscus and cuscus, or cuscus and any other animal, brings forth a superb demonstration of its power of "cussing." Most large possums have guttural voices varying in degree, but the New Guinea Spotted Cuscus utters a most violent barking snarl, if one may so describe it. Actually, with one paw raised, the animal commences on a sharp bark sufficiently startling to bring about an involuntary jump on the part of anyone present. This sound is sustained for a minute or more and then trails away into a venomous nasal snarl. Provocation brings renewed barks, cuffing actions of the forearms, and even savage bites.

Living strictly in the thick cover of the jungle



This Spotted Cuscus (Pong) has lived for nine years in captivity in Australia, which is something of a record. It is a creature of the night, and by day it sleeps curled up in the branch of a tree, with its prehensile tail holding tightly.



The Cuscus has a monkey-like face and is, in fact, frequently mistaken — by non-zoologists — for a monkey. Its yellow-rimmed eyes protrude noticeably. A big male may measure as much as three and one-half feet in length.

scrub where it is screened in the tree foliage, the cuscus exhibits a worn rump patch like that of the Koala – a condition brought about in both cases by all day "pole sitting." It feeds at night on fruits such as mangoes, pawpaws and berries, as well as leaves, large insects and even birds and their eggs. Bananas are particular favorites, and in captivity the animals are partial to hard boiled egg. In conjunction with the marked tendency towards a carnivorous habit, the dentition of the cuscus shows a stronger development of the canine teeth than is the case in our large mainland possums (*Trichosurus* spp.). Like the Koala and Ringtailed Possum on the other hand, its forepaws have digits 1 and 2 acting as thumbs – that is, opposable to digits 3, 4 and 5 – giving it very strong gripping power in climbing.

The cuscus has a deadly fear of its chief enemy the python and the only occasion on which I have seen a Spotted Cuscus panic-stricken and jolted out of its usual sluggishness occurred when a big Amethyst Python, quite invisible to the marsupial, slithered slowly across the roof of its indoor enclosure. Possibly the cuscus also smelled its natural enemy; but the unmistakable uninterrupted sliding sound of the moving python appeared to be the main reason for the very real fear displayed by the animal.

News from the Conservation Foundation

"Our Plundered Planet" Wins High Citation

"The Most Important Book of 1948" *is the commendation given President Fairfield Osborn's "Our Plundered Planet" in an editorial in the National Education Association Journal for January,* 1949, *written by the editor, Joy Elmer Morgan. The National Education Association with headquarters in Washington, D. C., is the leading organization of its kind in the country, reaching and influencing the majority of the approximately* 1,000,000 *school teachers in the United States either directly or through its affiliated associations.*

The editorial, entitled "The Silent War" opens with a quotation from the introduction to "Our Plundered Planet." The balance of this fine tribute is printed here for the benefit of Society members.

FAIRFIELD OSBORN, eminent president of the New York Zoological Society, has performed outstanding service to humanity in his recent book, *Our Plundered Planet,* which we hereby name "The Most Important Book of 1948." For a number of years we have been calling attention to one book in this way, seeking to select a volume which if studied by all the people would help to build the understanding essential to the successful operation of democratic society. Our minds today are assailed by so many distractions that it is difficult to keep the emphasis on what is most important. Yet we must learn certain essentials for survival or we perish. We cannot go on forever living in the present with no thought of the future or no sense of obligation to the generations that shall follow us. If world population continues to increase at the rate of 20,000,000 a year in spite of war and disease, while each year soil is lost or destroyed which would feed 10,000,000 people, nothing but increasing poverty, conflict, and disaster can lie ahead.

Our American resources have been so abundant that it is difficult for our people to realize that they are limited and that the end is already in sight for some of the things essential to our present way of life. This book should help to wake us up. It should be given a place in the curriculum that would bring it to the attention of every high school and college student for years to come.

The book has rare perspective and charm. It covers the whole earth over the period of known history, showing what has happened to one nation after another and why. It is filled with facts and figures that lead to inescapable conclusions. Our generation must come to realize that we live in a hungry world where most lands are already overpopulated. Nor can science and industry give the answer; they may merely hasten the process of destruction. Take any improvement like hybrid corn. It must be apparent that harvesting 200 bushels of corn off each acre each year will exhaust the minerals in the soil quicker than taking 20 bushels.

Greed has played a large part in wasting the soil. Upper mountain slopes have been deforested; good pastures plowed into poor fields; ranges overloaded with sheep – and this in country after country, century after century. That is why sand covers Roman cities that were once the glory of North Africa; ruined temples stand in Syria on stony hills once soil-covered; Spain lives in poverty; and Greece and Italy present political problems that are almost insoluble.

Teachers – perhaps more than any other group – are concerned with the future. They can do much to determine whether we "are to continue on the same dusty perilous road once traveled to its dead end by other mighty and splendid nations" or whether we shall conserve and intelligently use our God-given and irreplaceable heritage. We must teach as tho the very survival of civilization depended upon our teaching.

JOY ELMER MORGAN, *Editor*

Five New Trustees Elected to Conservation Foundation

Kent Leavitt, Clarence M. Malone, Paul Mellon, Lithgow Osborne and Randolph G. Pack have recently been elected to the Board of Trustees of the Conservation Foundation.

Conservation Foundation Considers Radio

Several inquiries with respect to radio programs on the subject of conservation have led the Foundation staff to give considerable thought to the possibility of such programs and also to the position which the Foundation should take with respect to this great educational force. At the present time it is their intention to prepare the basic outline for programs with the expectation that at some future date they may be called upon by potential sponsors to supply such material. Able radio production people have expressed an interest in working with the Foundation in the building of such radio "shows."

Director and Editor Appointed

John H. Storer who has been responsible for all conservation film photography has been appointed the Foundation's Director of Film Production, and John C. Gibbs is named Editor. George E. Brewer, Jr. will carry on as Producer for the conservation film program.

U. S. Office of Education Interested In Conservation Films

Dr. Glen Blough, chairman of the Interdivisional Committee on Conservation of the United States Office of Education has expressed interest to Mr. A. William Smith of the Conservation Foundation on the subject of the preparation of a film on Teaching Methods in the Natural Sciences with particular emphasis on the teaching of conservation of natural resources. Dr. Blough would like to have some assistance from the Foundation in the preparation of the script for such a film and also in its production. This matter is under consideration at the Foundation, it being apparent that such a film would serve a useful purpose and have large distribution.

New Conservation Films Soon Available

The Impact Film, a version of the Living Earth Series revised for commercial distribution, is expected to be ready for release shortly after the first of March and at or about the same time it is hoped that the first of the Living Forest Series will also be available for exhibition. These two films, according to George Brewer of the Conservation Foundation, will be sound tracked early in February. Shortly after these two motion pictures are in exhibition form it is hoped that the new Living Forest Series of three films, produced for school use, will also be available.

Meetings Attended

Fairfield Osborn addressed the 51st Yama Conference of the National Industrial Conference Board at their meeting held November 5th to 7th, 1948 at Absecon, New Jersey.

On November 18th, 1948, Mr. Fairfield Osborn addressed the Second Annual Meeting of the National Conference of Editorial Writers at Louisville, Kentucky, taking his theme from "Our Plundered Planet." A large number of letters have since been received indicating a wide range of new interest in the conservation problem on the part of editorial writers on many of the most influential newspapers throughout the country. Already we are finding evidence of the value of this meeting through clippings which have been received.

On Saturday, January 15th, Mr. Osborn addressed the convention of the Ohio Forestry Association at Columbus, Ohio.

On January 26th and 27th, Robert Snider of the Conservation Foundation and Christopher Coates of the New York Zoological Society attended the conference called by the United States State Department for the purpose of discussing fishery problems on the Atlantic Coast. The meeting was held in Washington, D. C.

On February 8th, 1949, President Osborn was the guest speaker at an evening meeting called by Secretary of the Interior Krug and Dr. Vannevar Bush. The meeting was held in the Elihu Root Auditorium of the Carnegie Institution in Washington.

Further Adventures of Charles Cordier

(*Continued from Page 9*)

first sending out a few scouts to find out about the presence or absence of the Bongos. It was brought home to me with force that there is no way of doing anything useful with these Turumbu. I slept at the Lubilu River camp one night. On clearing the ground for a tent kindly lent me by the agricultural station people, a lot of mouldly elephant bones were found.

Early the following morning I went back down the river. Now I have to say a few words about getting the Bongo cages-to-be out by water. It would have been absolutely impossible on account of too many dead trees obstructing the river bed. On the other hand, Auguste found it would have been easy to get them out over the trail!

On the second day I was back at Yangambi and then took the truck back to Yalibutu. The day following I went into the forest in the opposite direction and girded myself for a long, painful walk. The foot didn't hurt any more. [Charles' right leg had been broken in the forest last February 3]. For about half a mile the trail was through water, along a river bed and then across swamps. I didn't mind since I had 34 men with me and expected to finish once and for all with the Black Guineafowl and Afropavo business. We had left at 9:15 A.M. and suddenly, at 11:30 A.M., were in a large hunters' camp. I asked incredulously if this was to be the end of our journey. "Yes," was the reply.

"What about that eight hours' walk?"

"Oh, we Turumbu don't know anything about hours or distances. This is where we stay and find leaves for our shelters."

In the afternoon the chaps with nets went off within shouting distance and in no time brought back one Black Guineafowl. The next morning the weather was wonderful but the men at 8 A.M. made no move to go about their work. I had to use some strong language. Then they wanted strings for their traps. I distributed 300 of these, ten to a man. On the second day they brought two Black Guineafowls caught in the slings. Rarely have I witnessed worse pandemonium than that when about 25 chaps came in with those two birds, both in the same bag, of course, although they had five bags with them. The blowing into Bongo horns, the yelling and shouting were tremendous, fit to scare the game for miles around. On the fourth day the dear fellows again had to be urged to leave at 8 A.M. Nothing was brought in all day. I realized that the deal I had made with them – 5 francs per man each day or 150 francs per bird, whichever would average out to their advantage – was no good for me. In the afternoon it rained a little and at 3 P.M. I urged them all to bring back the slings. I decided I was through with these Turumbu and could not get rid of the suspicion that about half of them were just loafing. The slings they brought back confirmed this. Half of them were not even wet, although it had rained.

After this disheartening experience, we proceeded with the truck to the next village, about 25 kilometers distant, but in Banalia territory. The name of the village is Bandele and the people are of the Bamanga tribe. Here I tried another approach with the natives, oozing brotherly love, good will and plenty of frangas [francs]. That worked exactly one day, then the novelty wore off. I got one Black Guineafowl and lost the same day the two that had been caught in foot slings before.

On the second day, the natives declared flatly that since I had come from Isangi territory and was now in Bengamisa territory, I had no authority and they were fed up with being pestered by this live animal business.

We packed our things to leave, although we could see the village was stuffed with dry meat and a horde of cyclists from Yangambi was coming and going, dried meat being the motive. We had heard about this all along the road.

All of a sudden I had an inspiration. We stopped two of these slick cyclists and asked for their traveling passes. They hadn't any. I held these, called the village chief and threatened to take these two men, plus any others who might appear, to the Bengamisa jail and to have their whole illicit meat export and hunting stopped for good by explaining everything to the "Muzungu" [white man-official] at Bengamisa.

That did it. Within no time they were actually on their knees begging me not to go to Bengamisa. I promised on condition they would cooperate. Now we are on honeymoon relations and today got a male Yellow-backed Duiker, an animal the size of a month-old calf, plus two Elephant Shrews which were netted.

At 15 kilometers from here they swear the Bongo Antelope wanders along the highway. This road, by the way, is absolutely untravelled by cars. In two weeks we have seen none. One cattle truck went through today. The road runs through at least 60 miles of unbroken forest reserve.

5 days later, still at
Bandele rest house

My honeymoon relations with the natives here are at an end. The only chap who actually put out some foot slings for Afropavo came back yesterday from the hunting camp situated near the Aruwimi River. He brought with him one dead Black Guineafowl. . . . That's all I received in five days.

I have seen the village chaps leave with their nets at 9 A.M. and come back at 1 P.M. Voluntary cooperation does simply not exist.

I am getting so desperate for Afropavo I am seriously considering going back to Ayena. [The abandoned gold mine near which Charles broke his leg, as recounted in the Zoological Society's Congo Newsletters last spring].

We have tarried so long here because I got laid low by an attack of malaria.

Tomorrow I hope to leave for Bengamisa, run up to Banalia to investigate Afropavo and Bongo possibilities, leave, perhaps, Auguste the carpenter there and then take the little we have to Kisubi. [Charles' base camp, tended by Mrs. Cordier, is at Kisubi, across the Congo River from Stanleyville].

Twenty-four days of collecting have resulted in the following additions to our stock:

1 Yellow-backed Duiker Antelope, *Cephalophus sylvicultor*.
[Each soulful look he gives me reminds me of Borden's cow Elsie]
1 Elephant Shrew
2 Black Guineafowls [both males probably]

1 Pigeon
6 eggs of Tufted Guineafowl under broody domestic hen

At the last minute:
1 Hartlaub's Duck
1 Francolin

15 km south of Banalia
Around October 28 or 29

It's a sad state of affairs that I find so much time to write. Yesterday we left Bandele headed west. Six miles out we stopped to get our seventeen Bongo wire-cable foot slings and two pliers we had lent the two "Sultanis" of the next two villages, having advised them we would want them the day previous. One Sultani said he had none on hand, the other had three, the rest of the slings were still out, the men had no time to bring them in, it was that far. As for the pliers, they were still with the men placing the nooses. I pointed out there had been ample time to bring them in and made him get into the truck to deliver him to the white man in charge of his district. He was slow and reluctant to get up.

When the Sultani realized I was in earnest, he called out and one of his "subjects" brought four slings. With some more prompting the pliers came forward. With the next Sultani it was an exact repetition. Finally, all but four of the wires were accounted for and for these I made them pay. I set the two chaps loose and then some outsider remarked there were no Bongos in this region at all. Every one assented, even the two Sultanis. The Bamanga have a reputation for being thieves. They had probably made up the story about plenty of Bongos in the hope of getting something out of it.

With a delay of one and a half hours, we proceeded on our way, soon to be stopped by a fallen tree. It had to be cleared, then, from time to time some more, seven in all. Fortunately, none were large. Some of these involuntary stops provided opportunities for force-feeding the Duck, Francolin and Elephant Shrew.

On arrival at the intersection with the Stanleyville-Buta highway, the temptation was strong to go south to Kisubi but I wanted information on Bongos and Afropavos around Banalia. It was 4 P.M. Saturday afternoon by the time we reached it.

Before dark we went back 10 kilometers trying to locate the Sultani who, in May or June, when I was hunting around here for a camping site, had offered to go for a Bongo right away. I also wanted to talk to the boy who had then offered to get me Afropavo for 30 francs apiece. None of them I could find any more. The other villagers and chiefs were, or seemed, interested in my generous prices and promised to go the following day, a Sunday, all their other days being taken up by road work. On being pressed as to where they would find Bongos and Afropavos, their replies were vague but finally they agreed they would take their dugouts, paddle across the Aruwimi River to get them there. Not being satisfied with this I explained to them that their nets were too small for Bongos, but Afropavos, called here among the Mangelima tribe "Ngobe," they would get for sure [among the Bamanga tribe the bird's name is "Ngokola"]. Unfortunately, the veracity of their assertions could not be checked as it rained from 3 A.M. to 11 A.M. One native who seems to be brighter than the rest suggested I should go talk to Lubo, the Chef de Secteur on the Buta road, 15 kilometers north of Banalia, he having many hunters adept at getting big game in pits. He also said that in that territory Afropavo is plentiful.

So in the late morning I made off with the truck. We were lucky at finding Lubo on the road. We explained we wanted Bongos and Afropavos. He looked and behaved with the natives very much like Lisa at Obokote [mentioned in Newsletters]. He said right away we could get Bongos, Aardvarks and Giant Pangolins through his men, who specialize in this. Afropavos, too, but from the LEFT bank of the Aruwimi, on the right bank there being none.

When we got back to our Rest House, I called for all the village men and asked them to confirm their hunting Afropavo on the RIGHT bank of the Aruwimi.

They then all agreed they were referring to the Guineafowl, not to Afropavo.

The day previous at least twenty of them had stated emphatically that Afropavo was on the other side of the Aruwimi, now it was the other way around. . . . Who will ever understand these natives?

Stanleyville, Nov. 3, 1948

I am finishing this here at Kisubi. A moment ago departed a party of government officials who came to look at the collection. One of them said he has often shot Afropavo in the forest of the Province Equatoriale, near Coquilhatville. This might interest Dr. Chapin of the Museum of Natural History.

Thanks for the jeep wheel wrench. It will come in handy right now. A few days ago Emy's chauffeur left the jeep on the steep incline in front of the Congo ferry, engaging only the handbrake. He then went off on some errand. The passengers in the rear jumped out. With the shaking, the car rolled down and plunged into the Congo. Only the top of the cabin remained visible. It was fished out and restored to usefulness, but not without a lot of bother.

— CHARLES

Mrs. Cordier has the responsibility for maintaining the animals that her husband collects, and the following brief note from her to Miss Grace Davall, assistant to the General Curator, indicates that there are some pleasant moments with pet animals during work-filled days.

Kisubi, December 17, 1948

Dear Miss Davall:

On my lap is a Linsang (Nandina binotata) from the savanna country; it is tame, a gift from a lady in Stanleyville. It is playing with the other Linsang Mr. Bridges brought from Lubutu, and the Civet which is free about the house, like a dog. The first two I only let out of their cages every second day to keep them tame and exercised. The three of them are a terror. They play until exhausted and then rest on my lap or shoulder.

It is now 3 P.M. In a half hour the evening food has to be prepared for all beasts (now 110) and this lasts until 6 P.M.

After that I still have some of the animals to observe and if there are a few minutes to relax before supper I am lucky. After dinner some more tours of inspection. It is now a week that the ants have left our camp and I can sleep better.

EMY

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

Dr. Alvarez, Leading Mexican Ichthyologist, to Work with Dr. Gordon at Society's Laboratory

Señor José Alvarez del Villar of Escuela Nacional de Ciencias Biologicas, Instituto Politecnico Nacional, Mexico City, is now at the University of California, La Jolla, working with Dr. Carl L. Hubbs in the initial stages of preparing the final draft of a manuscript on the freshwater fishes of eastern Mexico. This project was begun by Doctor Carl Hubbs and Doctor Myron Gordon, Geneticist of the Society, some 15 years ago. When Dr. Gordon was in Mexico City early last year he suggested that Señor Alvarez, Mexico's leading ichthyologist, join in this major biological enterprise. Some time in February this year, Señor Alvarez will work with Dr. Gordon at the Society's Genetics Laboratory. Señor Alvarez is here on a United States Government Department of State fellowship.

Introducing a New Member of the Staff

Judging from the streams of letters that appear regularly on the desks of executives in every Zoo in the land, work with living animals is an idea that has great appeal to young people. Mostly, the point of attraction seems to be animal contacts, with collecting expeditions to far places a close second. Actual work isn't usually an integral part of the picture. Probably that is why few of the aspirants reach their evanescent goal.

When Robert McClung joined our staff on July 19, 1948, as Assistant in the Mammal and Bird Departments, he proved himself the almost unique exception. From early childhood, his interests centered in nature out of doors. Summers on grandfather's farm gave scope for development and even material for a recent book "Wings in the Woods." Four years at Princeton, with a major in biology, resulted only in fixing the young man's aim: work in a Zoo. Two years as an advertising copywriter, followed by nearly five years in the Navy, left the ambition undimmed. Discharged at Okinawa in October, 1945, after serving as Landing Signal Officer on a carrier with the rank of Lieutenant-Commander, Mr. McClung returned to copy-writing. But the old urge was strong and following advice received on a visit to the Zoological Park, he enrolled at Cornell for a post-graduate course in Zoology. After the granting of a Master's degree, Mr. McClung reported for duty in the Zoological Park. Already popular with both staff and keeper personnel, there is every indication that a long and useful career in his chosen field lies ahead.

—L.S.C.

Report on Cancer Work

The first paper in a series of reports on the inter-relationship of hormones and antivitamins has been published by Dr. Ross F. Nigrelli, the Aquarium's pathologist, and Dr. E. D. Goldsmith of New York University Dental College. The experiments on which the paper is based were made possible by a grant from the National Cancer Institute of the United States Public Health Service.

Fishery Biologists Meet

Students of sanitary engineering seldom have sufficient training in biology and are therefore unaware of the broader implications of polluted

waters, especially those concerning long-term conservation. To remedy this condition fishery biologists and their associates met at the Zoological Park in January to arrange meetings at which problems in fishery biology, aquatic conservation, specific problems of pollution in the New York area, and a curriculum of training for undergraduates in the sanitary engineering field can be discussed.

A Longevity Record

Up to 1916, the Eastern Cock of the Rock, found locally from southern Venezuela to northern Brazil, was a bird we very much wanted but never really expected to see. However, in June of that year, Dr. Beebe brought us from British Guiana a beautiful specimen that filled the gap. Since that time, we have seldom been without a representative of this rare species. Unfortunately, however, none of these birds has proved especially long lived and renewals have been required more frequently than we could have desired.

It is with some pride, therefore, that we record what we believe to be a longevity record for the species. An obviously young but full-colored male, purchased on September 29, 1933, lived with us until January 4, 1949, a period well over fifteen years. It is anti-climactic but satisfying to report that an excellent replacement has already been secured. —L.S.C.

Question House Was Busy

When Question House, the Society's animal information center in the Zoological Park, closed at the end of its fourth season on November 14, it had received 35,436 visitors since the opening on April 25. They asked a total of 13,865 questions, of which 1,093 were concerned with the life and habits of the Duck-billed Platypus.

Our Panda Picks Up

For some months the health of our Giant Panda has been causing concern, but at the beginning of the year she took a turn for the better and gained weight for the first time since last August – 19 pounds, to a total of 260 on January 18.

The Panda is weighed each month. A special crate is placed in front of her cage door on a portable platform scale. When the door is opened, she promptly but leisurely walks into the crate and sits there patiently while the scales are balanced and the weight recorded.

Her maximum weight since arrival on December 30, 1941 (when she weighed 57 pounds and was a year to a year and a half old) was 379 pounds in July, 1947.

Last August she developed an intestinal impaction and for months refused any food except milk – a poor diet, of course, for an animal that normally feeds on bamboo and cereal. Another intestinal disturbance in November further impaired her health and she was down to 241 pounds before Christmas. Then she regained her appetite for bamboo and cereal and we now hope that she is definitely on the upgrade.

There are at present three Giant Pandas in the United States – our female, a male in the Brookfield Zoo in Chicago, and a female in the St. Louis Zoo. All are adults.

PUBLICATIONS OF INTEREST

THE FLIGHT OF BIRDS. By John H. Storer. 94 pp., 176 illustrations. Cranbrook Institute of Science, Bloomfield Hills, Michigan, 1948. Price $2.50.

While the flight of birds undoubtedly gave rise to man's ambition to take to the air, centuries of observation revealed little to advance solution of the problem. Curiously, it is only through the gradual development of the theories of aerodynamics, keeping pace with physical aviation, that the mysteries of bird flight are being unravelled. Mr. Storer, now official photographer for the Conservation Foundation and long well-known for his superb motion pictures of birds, has produced a graphic summary of present knowledge. Cuts from slow motion films have been selected to point out the many adaptations of wings and feathers that give birds mastery of the air. Drawings in black and white illustrate air flows and stresses, well integrated with simple but definitive text. – L.S.C.

BIRD DISPLAY AND BEHAVIOUR. By Edward A. Armstrong. Pp. 431, 58 illus. Lindsay Drummond, Lt., London, 1947. 21 shillings.

The present volume, as stated by the publishers, is an enlarged and extensively re-written edition of a previous work by the same author, printed in 1942 under the simple title of "Bird Display." Mr. Armstrong's initial effort was the first attempt to gather between two covers the scattered mass of rapidly increasing material relating to general behavior in birds. The mounting interest in this phase of investigation brought general and well-deserved acclaim. The new edition, enlarged in content as well as in text, is well abreast of the current rapid progress of factual investigation and understanding. There is evidence of much scholarly research, while interpretations are made with reserve.

The three-part index and the extensive bibliography are, in themselves, invaluable to the student. The illustrations, for the most part, are well-chosen and expressive, particularly when the subjects were living birds. — L.S.C.

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ANIMAL KINGDOM

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We Don't Realize Yet

WHILE INTEREST in the Conservation movement is constantly growing and in certain respects, such as the protection of wildlife, definite strides ahead have been made, the degree of realization concerning the seriousness of the situation as to forests, productive soils and water sources is still very limited – merely a wave on the ocean of public opinion as a whole. Organizations that are involved in the Conservation movement are apt to be deluded into thinking that the understanding of the problem is more widespread than is actually the case. An amusing episode in this connection occurred a while ago at the National Wildlife Conference. On the morning of the opening of the conference the corridors and breakfast rooms of the hotel that was headquarters for the meetings were rapidly filling with an eager crowd of people from all over the country. Somebody in a spirit of playfulness asked a stranger, evidently unfamiliar with the affair, what convention this big crowd was attending. "Oh," he said, "I'm told this is the Wildlife Conference." "What's that?" asked the playful interrogator. "I'm not dead sure," said the stranger. "The bell-hop said something about it being the meeting of the National Association of Animal Trainers!"

. . . . . .

Speaking of wildlife conservation, a real thrill awaits anyone who visits the new Everglades National Park in Florida. The nesting colonies of Great White Herons, Egrets, Ibises and Roseate Spoonbills are a sight to see – thousands of birds on their island refuges, either in the Keys or in inland lakes, now presumably protected for the long future. Our sister-institution, the National Audubon Society, has accomplished an outstanding piece of conservation work. It was this institution that through the long years preceding the inclusion of this area in the new National Park, stood guard over these sanctuaries.

Fairfield Osborn

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Moth Nights at Rancho Grande

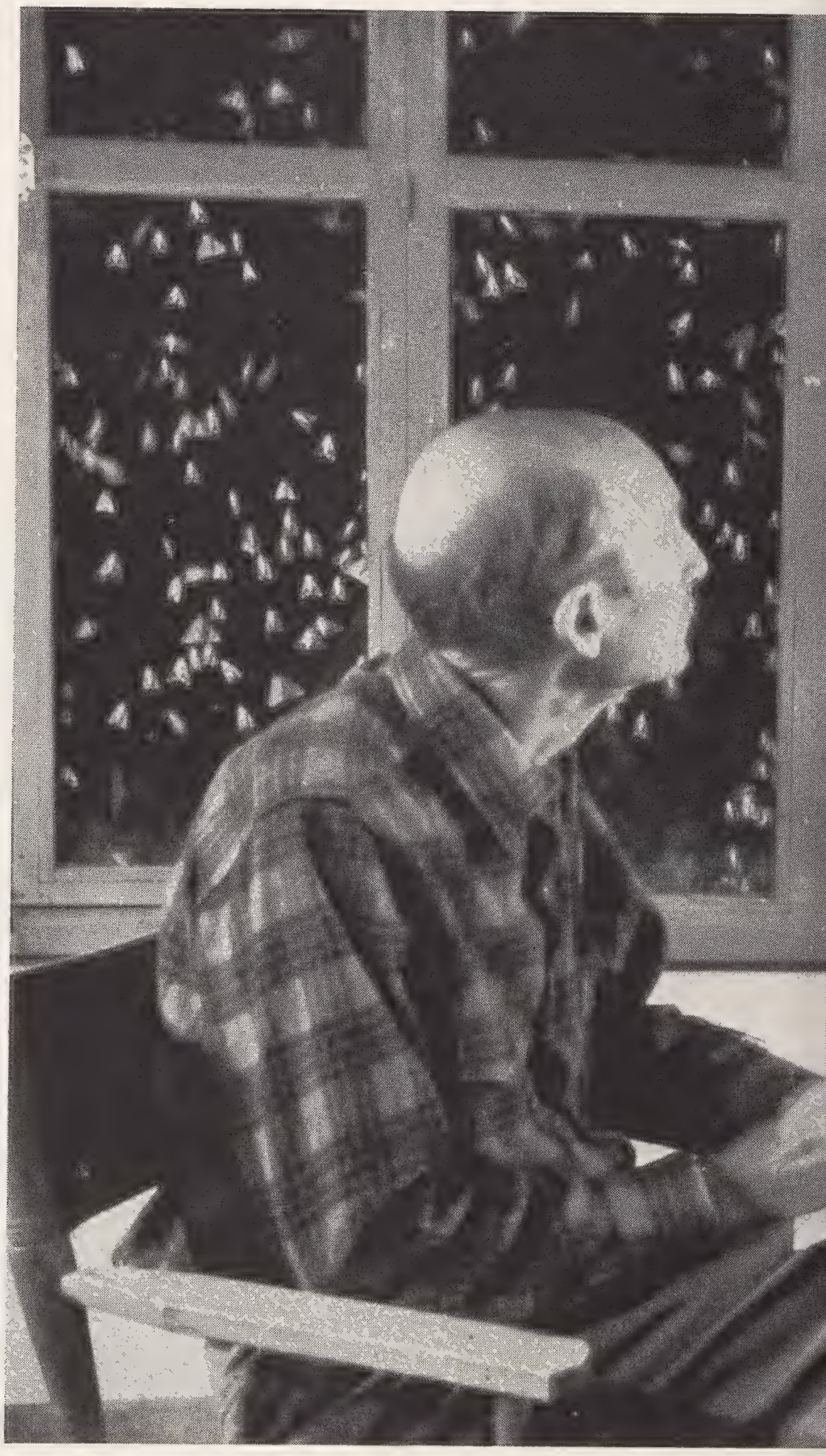
By WILLIAM BEEBE

The expeditions of the Zoological Society's Department of Tropical Research to Rancho Grande were made possible through the courtesy of the Venezuelan Government and the generosity of the Creole Petroleum Corporation. This article is part of a chapter from Dr. Beebe's forthcoming book, entitled "High Jungle," to be published in the spring by Duell, Sloan and Pearce. The photographs are by Jocelyn Crane.

IT IS THE TWELFTH OF AUGUST at Rancho Grande and at nine o'clock in the evening the full moon is tearing through a veil of neblina fog — now and then showing as an oxydized plaque of silver with a patine of gray film, then passing into total eclipse, and out again.

Outside the laboratory door we enter the dark mystery of the covered verandah. We snap on our flash and begin to climb and climb. Soon we cross a gaping hole on a twelve inch board, then turn sideways and sidle over a slimy foot-wide bridge, bending over a thirty-foot drop. This last obstacle brings us to the foot of a ladder, the top of which rests against the ultimate roof. Here are three white walls facing south, west and east, and at the summit of each is a powerful electric light.

The white expanse is dotted with beads, bangles, spangles, lovely buttons, tassels, brooches, baubles, trinkets and shreds of arras. It is easy to compare the sight with an exhibit of exquisite miniatures and jewelry of man's fashioning through the ages — ages, at most, five thousand years. Instead, here are wonderful living beings



whose ancestral development leads back through millions of years, whose pattern has reason as well as intricacy, whose colors mean life and death as well as breathless beauty.

A big patch lies flat against the wall, a medley of variegated lichen, with a whole optical flora of mold and fungus, with holes eaten by various creatures, all this on an expanse of the wings of a moon-moth spreading full ten inches. Here are wasps which are not wasps, beetles which are moths, moths with wings rolled tight as maps or graduation vellums. Here are all but invisible craneflies dancing up and down on bended knees for no reason that our poor brains can fathom. I sit down on the floor of the roof the better to write and a giant hercules beetle just misses my



head and crashes against the wall, flops to the ground and lies helplessly on its back, waving its legs, no worse for the head-on collision.

A medium moth of black and amber has a pattern which means nothing to the most learned entomologist, but the pigmental ideographs would surely be kindergarten messages to a Babylonian or Assyrian child. I shift a foot, hear a crunch and shudder with regret that I have flattened a huge emerald scarab. Before my emotion passes, four others have barged in out of the fog, three alighting on the wall, the fourth on my sleeve. One of my eye-glasses is obliterated, and into my lap I brush a soft, gray fuzzy moth. As it alights it falls on its side, its wings stretch far up, and the body curves around into an unpleasant hairy caterpillar, or so it appears. Upon the insect a trance has settled which neither shaking nor dropping will disturb. If I were a hungry bird or lizard I should have nothing to do with this unpleasant object, and that is exactly what this unconscious induced display is trying to effect.

Here and there amid all this Aladdin's cave of glaring pattern and color are drab folk, who in the shadow of their wings, raise their bodies on high with the tip weaving back and forth, and spraying out a flower-like mass of living, moving hairs, gold and iridescent. If our nostrils were as good as our eyes the air around might show arabesques and obliquities of crossing and recrossing scents and odors; all ambrosial, all impelling motives to waiting, color-blind recipients.

Moths have a definite special rhythm in time. The big sphinx come later in the evening and hurtle in through the fog, striking with terrific impact against the walls or my body. Perfect antitheses are the bats which swing in out of nowhere, seize a moth and vanish into nothing, with all the surety of their magic sonar.

One of the supremely lovely creatures forced hither by the impelling glare is a soft-hued brown, which in the course of its ancestry had a fairy-sized pail of liquid gold spilled over its wings, and this had run and dripped before it solidified into thick drops and gobs. Next to it an exquisite triangle of a moth had as its center a heart-shaped hand mirror of sheer polished silver, the beauty of which, with its dark marble setting, was beyond anything on the cosmetic table of a Venus or a Cleopatra.



Moths in countless numbers cling to the white walls on top of Rancho Grande, or form a fluttering carpet on the roof. Dr. Beebe makes a selection of the more interesting ones.

If these similes seem maudlin, far-fetched and ultra sentimentalized, please look at the moths and suggest better ones!

Remembering the dozens of drawers of wing-stretched moths in our collection at home, I decided to record natural living positions and to collect and mount specimens in the poses which the god of evolution had allotted. Instantly new patterns became apparent. Unfinished lines, curves and angles, which in museum insects meaninglessly ended in space at the edges of wings, now became complete, the sections fitting nicely together, like the cut-out bits of a jig-saw puzzle. A protractor became an important entomological instrument to reveal the exact degrees of divergence of wings at rest. Again we went to the living insects and had them tell us their secrets. There were many surprises, as when certain of the sphinx moths refused to fit themselves conventionally to the usual sphinx-design and always, in the rearranged wings, there was a significant shift in pattern and colors to make such innovations possible.

We think of the wings of a moth in two planes of space – they have upper and under sides, but hardly more thickness than a sheet of paper – yet I found that even these filmy appendages, while still attached to their living owners, may enter our own world of three dimensions. The feathers of the wings of birds, especially the larger species, have considerable bending mobility, as witness the up-turn of the ends of the primaries of a vulture. But this is the limit of this character. On the electric-lighted walls were moths whose wings were actually rolled into scrolls and twisted into S forms. This folding was new to dead-insect observation and at once I collected a

dozen examples. In the morning I had twelve moths in the killing bottle, all with flat, straight wings. The strange postures were characteristic of life, and with death the muscles relaxed. So I made notes and sketches and photographs of the wall moths' postures in situ, then enclosed each in a little glass home, and aligned them downstairs on my table. Next morning came new surprises, for I found most of the insects in quite new positions, and I was compelled to differentiate between Alighting and Resting Positions.

Perhaps there has never been a more perfect opportunity to watch, study and wonder at such massed moths as every evening provided. And I doubt if anyone ever had a more profound conviction of opportunities wasted as when I look back on what I was able to do in the hours under consideration. On the roof we could record the exact position of the wings, but in the laboratory everything was reversed. Here we were inside, with the moths coming in crowds to our hundreds of square feet of windows. Although it was the opposite end of the year, one of the first similes that came to mind, was looking from a high window, down at the New Year's crowds in Times Square. Attempting to describe the separate individuals seemed no more difficult than to glean accurate data from the uncountable moths.

On these nights, on the roof, Henry Fleming's clothing and even face soon were coated with a fur of moths. The color of clothes became invisible; it was impossible to see or breathe without constant brushing. Each of us had to be demothed before returning to the laboratory. A few days later, not a single moth of the dominant forms was to be seen, but others had taken their place. I know I am repeating and over-laboring the subject of moths, but this experience was a phenomenon wholly new to all of us. Except for the lights we would never have known of these hosts. A walk through the jungle by day or night, reveals one, possibly two or rarely as many as ten moths, mostly small; never more.

The reason for this scarcity became clear when we found that almost nightly a mighty migration of moths was going on through Portachuelo Pass. On clear nights this concentrated swarm of un-

An entomologist in the kind of trouble he likes — Henry Fleming is beset by moths when he goes out of doors with his net and collecting jar. Later he will have to be "de-mothed."



counted hosts flowed on and on, due south, into unknown regions. At times of fog or rain they were deflected in thousands by our roof and laboratory lights.

The constantly arriving motes on the laboratory windows and the never-ending slow, upward motion made observation difficult, and I was glad occasionally to see that hard-boiled visiting economic entomologists felt the same. The shifting and kaleidoscopic movement wrought a sort of hypnotic influence, and we found ourselves gazing unfocussedly at the shifting, colored mass, and requiring real effort to snap into constructive, zoological consciousness.

The effect of occasional superabundant nights of moths was much the same on all observers. A single moth might be recognized as an exquisite organism, perhaps as a new species, thus fulfilling aesthetic and scientific destinies; its habits were perhaps vitally interesting, its life history absorbing. Two of the same kind, or five or six might show significant variations of color and pattern. But when hordes upon hordes poured in, our sensations changed to disgust and even horror. The rabble of moths became an enormous, amorphous super-organism, as of unadjusted moth-cells uncountable. The swarms pressed against the windows, piled up in writhing windrows, manacled by the unreasoning drawing of light. What sun, moon and stars cannot do, is performed by a single 100-watt bulb.

It was necessary to develop a new method of identification, for through the windows we were looking at the reverse side of those on the roof walls. Here we saw them from beneath, and at first, the brilliant colors of many of the ventral bodies and wings refused to be correlated with the protective, leaf brown upper sides of the wings of the same individuals. Here we could verify the positions of legs and where the antennae had vanished. The moths were so close that our eyes could be brought within a half inch of the glass panes, when, with a hand lens, there became clearly visible all the beauties and minutiae of external structure of scent glands, details of the under wings, and of heads with their glowing, red-gold eyes.

There was, however, a handicap of frustration, of inability on crowded nights to open the windows and collect any especially interesting insect.

This is a moth — a perfectly good live moth — but it has managed to camouflage itself as a broken twig; its head is hidden, wings twisted.



We invented a routine; one of us dashing outside, mounting a short ladder and capturing any desired insect, indicated by the pointing finger of a confederate within the laboratory. These general conditions recalled my never-realized intention to have a collection of bird skins, considerably flattened as to breast, so that, in their phalanxes of death in cabinet drawers, they might lie prone, and not supine, and thus expose to view the more familiar dorsal plumage.

Excessive numbers of moths did not necessarily mean a corresponding increase in interesting discoveries. It was on the evening of the eleventh of June when a weak, pallid half moon, mostly shrouded in thin neblina, kept the roof moths down to a total of only a few hundred. Yet one of these turned out to be the bell moth of the palisades (Animal Kingdom, No. 3, 1948).

Like a surprisingly lovely Christmas gift, something unexpected appeared outside the laboratory windows one evening, a moth of moths. The

wings slowly opened and shut, five wide inches of them, but what instantly caught the eye were the amazingly elongated tails. These streamed out behind to a distance four times the length of the body, twisting and turning toward the tips, yet motionless as the tendrils of a vine; widening at the end into flat, buffy blades, ruffled and fluted as a monkey ladder. They far out-lunaed the tails of our northern moth, reaching seven inches from antenna to tail-tip. Unlike the lovely green of our luna, this tropical moth possessed not a scintilla of bright coloring. It had all the restrained beauty of a hen pheasant – soft gray-fawn, tan, wood brown, buff, tingeing creamy-white with every neutral tone. The fore wings were compounded of a pigmental synthesis of dark brown leaves, together with pinkish-white lichens shaded with delicate jungle shadows. The tips were sheared abruptly off, as if some Atropos of this cloud forest had misused her instrument and snipped a non-vital fragment.



Still another moth finds protection by adopting a posture that gives it the appearance of a shrivelled leaf as it hangs from a twig in the forest.

One hundred and seventy-three years ago the appropriate name of *semiramis* was given to this lovely moth, and its finally accepted generic title proved equally apt – *Copiopteryx* or oar-winged.

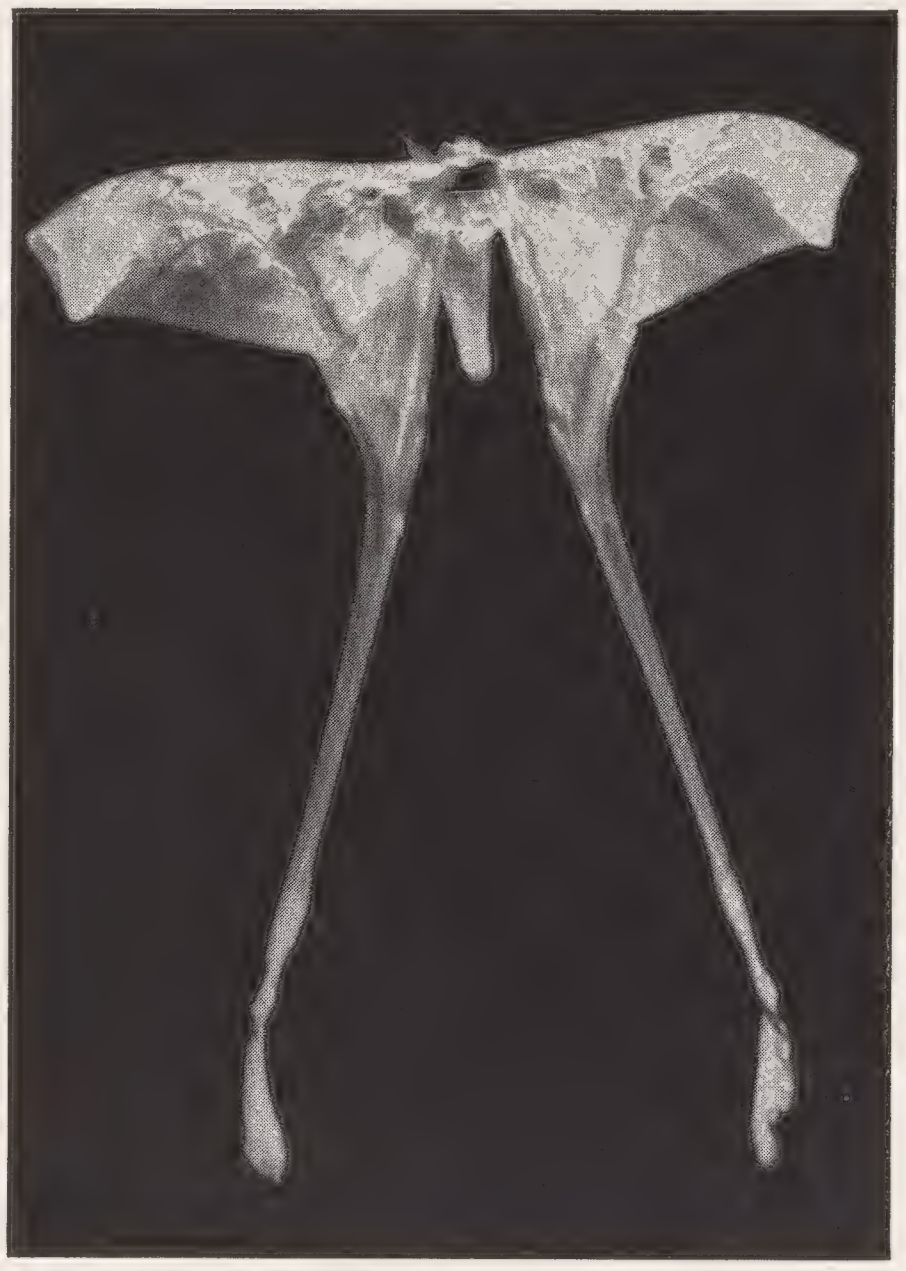
This was what we humans like to call a gentle or tame species, meaning in effect, one whose senses and reactions were adjusted to dangers more normal than a great thumb and forefinger closing upon its wings. I brought it into the laboratory and liberated it, watching the curious, slow circling which characterizes the flight of this moth with its pair of out-sized rudders. It came to rest on the leaf of a calathea and we photographed it, and then preserved its perfection for the collection.

Before the evening was over, another angle-wing, a female, appeared out of the blackness. This one had been through strenuous times, one wing was ragged, one tail quite torn away. How I wished for some means of communication so I could learn of the adventures which had befallen this moth to the present moment, its failures, accidents and successes. What occurred from now until its death was to be my special concern.

Late at night I placed the tattered female in a glass dish and hopefully turned off the lights. In the morning came justification and twenty eggs. They were a tenth of an inch in height, yellow green, with a red-brown band like the eggs of some birds and with a sculptured surface which became more intricate and beautiful the more it was magnified. Nine days later there uncoiled a score of minute caterpillars, each a quarter inch long. They were fantastic, pale lemon in color, beset in rows with a chevaux-de-frise of spiny spines, with an anterior pair directed straight forward like that of Taurus in the heavens. Behind these each tiny caterpillar sprouted a pair of branched antlers which would not have shamed an Irish elk. The appearance of these eager larvae threw light on part of the preceding life of the female angle-wing; somewhere she must have met and mated with one of her kind, the proof being this batch of fertile eggs.

Having acted as stepfather I was now helpless to carry on, and tragedy loomed. Science was served, since eggs and young were drawn with care. But always ignorance reared its head to block further advance. The first stage or instar of creatures such as these is often of importance

as showing ancestral characters which disappear in the next shedding of skin. But to complete our knowledge the caterpillars must be fed. I looked hopelessly out of the window over the great expanse of jungle. Somewhere within view was the tree or bush or vine upon which the instinct-wise mother would have deposited her eggs. The sight of the little chaps feeding eagerly upon their empty egg-shells drove me out, to pull this and that leaf and proffer them. I even divided the little brood into relays, and tried each lot with a different bouquet of leaves. They tasted and crawled and tasted and turned aside. I was thoroughly ashamed of my ignorance, but this is a chronic condition, so I took what joy I could from what we had learned of the Streamer-tailed moth of Rancho Grande.



"Like a surprisingly lovely Christmas gift, something unexpected appeared on the laboratory window—Copiopteryx, the oar-winged moth."

The thought of possible enemies came to mind and we realized that we already knew considerable about the foes of moths. We were able to make a list of almost a dozen, at the head of which unquestionably come bats. From the time when the first moths appear, on roof, porch and windows, bats of at least five species begin a ceaseless patrol, flying back and forth, taking toll. How they can detect by sonar, and seize such small, flying creatures is more than a mystery. I am quite sure, however, when they swing up to the windows, neatly pick off a small moth and bank out again, that it is by sight. Our ideas of the great part which migration through the pass plays in supplying the endless numbers of moths, night after night, are confirmed by the enormous quantities of detached wings, bat crumbs, which each morning finds fixed with neblina damp upon the leaves near this amazing flyway.

Frogs and toads, judging both by our captive specimens and the solemn circle of expectant amphibians around the porch lights, esteem moths highly. Small and even medium-sized moths also frequently appear as mummied rations hung in webs, awaiting the owners' hunger. Spiders, mice and monkeys feed eagerly on moths, and I have a list of six species of birds which batten on the mariposa crumbs which fall from the laboratory sills. The most amusing of the lot was the little band of anis or black cuckoos, in this case deserving the additional title of seven sisters. Within a week's time they developed a regular early morning search of the ground beneath our windows, feeding to repletion on half-dead or drowned moths. Fear of us had fled from their little brains in concentration on this regular, abundant manna.

After writing the above paragraphs in our Rancho Grande laboratory one evening, I went upstairs and opened a bedside book which was a Memoir of Sir Hans Sloane. The following paragraph, written two and a quarter centuries ago, is from the Preface to the second volume of the author's Natural History of Jamaica, and affords a welcome relief from our more modernistic view-points:

"The power, wisdom and providence of God Almighty, the Creator and Preserver of all things, appear no where more than in the smallest animals called insects, which are provided with such senses as are necessary to bring them through their several stages, to perfection; and notwithstanding their little bodies, and many enemies in every state, they are enabled to live, thrive and propagate their kind, so that, since we have any exact history of them, none seem to be lost."



The Aquarium profited from the draining of the Zoo's Beaver Pond; these large Carp were rescued. The largest weighed more than 15 lbs.

Animals Visit the Zoo, Too

By LEE S. CRANDALL

SOMEONE has remarked that the best zoological hunting grounds are found in institutional basements. Basements in the Zoological Park aren't usually productive but our heavily forested grounds are a satisfactory equivalent. Our wooded areas are the final southward extension of park and wild lands to the north, so that wandering native creatures are likely to end their travels here.

In the course of years most of the species existing in this region have been recorded here. Some are welcome additions to our sylvan attractions but predators must be controlled. Gray Squirrels, Chipmunks and Cotton-tails, representing ancient populations, are still abundant. Muskrats, common in outlying swamplands nearby, invade us frequently but seem no longer able to establish themselves here. One of the highlights of the visit of David Fleay, the well-known Australian naturalist who brought us our Platypuses in 1947, was his discovery, on a night-time prowl about our grounds, of a wandering Muskrat. It

was David's first experience with an American wild animal at large and his enthusiasm was almost ecstatic. Frequently, too, swimming Muskrats are mistaken for young Beavers, so that we are constantly checking such reports.

In the autumn of 1948, a White-tailed Deer was seen near the wooded enclosure where our own fine herd is kept. A quick count showed that the animal, an exceptionally large and beautiful doe, was not an escapee but a visitor from without, the first of her species to be recorded here. For two weeks she haunted the vicinity, leaping fences with agility and on at least one occasion smartly swimming the extensive breadth of Lake Agassiz. Eventually, she disappeared, presumably returning to the more secluded haunts from which she had come.

Some of our animal visitors are not natives but creatures escaped from neighboring owners or actually liberated here by them, with misguided good intentions. In 1943, a Red Fox was reported as lurking near the center of the Park. A quickly organized posse, armed with nets and other fox-catching devices, soon had the animal cornered. A glimpse of the fleeting form gave the impression that it was larger, darker and longer in the legs than the resident form. Closer examination, after the fugitive had been caged, confirmed these details and tentative identification as the Alaskan Red Fox was made. A few days later, the full story was developed. The animal had actually been picked up in Alaska by a soldier, who had sent it to his mother, living in the neighborhood of the Zoo. It had escaped its confines, following the normal expectation, and seemed naturally to have found its way to us.

Two years later, a bright red squirrel, with white underparts, was seen begging for peanuts along our Service Road. What it might be, we could not tell, but after much maneuvering, the animal was coaxed into a trap. It was then identifiable as the Colombian White-bellied Squirrel (*Sciurus saltuensis bondae*), a South American form certainly far removed from our area. Although this beautiful creature is still a valued exhibit in our revitalized Small Mammal House, its origin has never been disclosed.

Of local predators, we certainly have had our share. In the old days, Mink were fairly common and preyed too freely on waterfowl and captive

The Gray Fox that came to the Zoo — this is the specimen that was captured after it was sighted in the Zoological Park. It is quite tame, and may have been someone's pet animal.

gulls. Weasels made trouble enough and there is one tale that stands out in memory. A workman was clearing the banks of the brook running from the Beaver Pond, when his attention was attracted by a cock Silver Pheasant, recently liberated. As the man watched the bird move slowly along the edge of the stream, he was astounded to see a Weasel leap suddenly at the bird's head. At the watcher's shout, the Weasel fled but not until it had left the pheasant dead.

Raccoons have been with us always, a constant challenge to Keepers who must protect their charges from predators. No animal is more difficult to detect or trap, yet since 1940 alone, we have captured no less than ten and added them to our group. Raccoons, somehow, seem especially attracted to fish-eating birds, among which they are most destructive. Nesting ducks and geese, or roosting peafowl are never safe when there is a prowling Raccoon about.

The lowly Opossum, which of late years has been extending its range northward, is an animal that has troubled us only during recent years. In the last decade, twenty-two of these sluggish creatures have been taken here, many of them having been run down when disturbed during daylight hours. The Opossum is a slow-moving nocturnal animal that eats almost anything, from carrion up.

Really wild foxes have never been a problem here but two individuals come readily to mind. One takes us back to 1921 when an adult White-necked Crane, a large and powerful bird, was found decapitated. There were no signs by which the killer might be identified but a wire live-catching trap was hopefully set that evening. Early the next morning, the trap was found to contain a much chagrined Gray Fox. No one had seen him kill the crane – but at any rate there were no further depredations.

The second episode is the most recent of our experiences with wild animal visitors. On an afternoon in the first week of February, 1949, Curator Bridges looked out from a window of the Administration Building and saw a Gray Fox



calmly sunning itself in an open spot in the shrubbery. It was a beautiful picture but knowing what to expect from a Gray Fox, measures had to be taken. These measures were extensive in both space and time but at the end of a week the fox was cornered in a drain and induced to enter a box trap. Incidentally, the drain also contained the partly eaten remains of a Herring Gull.

Birds of many kinds, of course, are both resident and transient in the Zoological Park. For years we have attempted to establish Ring-necked Pheasants in the grounds, with no appreciable success. Ring-necks are notorious wanderers and work quickly away from liberation points. Now, however, they are well established here and are frequently seen, especially when the ground is snow-covered.

Among bird predators, some have been of special interest. In 1919, an American Goshawk, a rare visitor to this area, preyed for a week on our waterfowl and finally was frightened off by a badly aimed blast from a shot-gun. Soon afterward, there were further depredations. This time the culprit proved to be an Arctic Horned Owl, the first representative of the form to be recorded in New York State. The Great Horned Owl has been responsible for many of our difficulties but often these are attributed to some other offender. So when a live trap set for a suspected Raccoon proved to be the downfall of a Horned Owl, we felt that the ends of justice had been well served.



They Proved It—

The Fish Shoots!

By JAMES W. ATZ

The Archer Fish, cruising just under the surface, sights the spider that is suspended over the water. The fish gets into position to shoot.



The spurt of water, ejected from the fish's mouth, starts toward the prey. The stream is formed by a series of separate droplets.

When travelers to the East Indies first brought back tales about a fish that captured its prey by shooting it with drops of water, few people believed them. Who could credit tales of a fish that cruised about the surface of its aquatic home, keeping a sharp look-out for insects and other small creatures resting on plants or on the shore *out of water,* and that having sighted its prospective prey, carefully maneuvered into position and then spat at the tiny target with such accuracy and force that it was knocked into the water, there to be promptly devoured? Although practically everything that was ever claimed about this piscine Daniel Boone turned out to be absolutely true, a controversy over its alleged abilities waxed and waned for nearly two hundred years and was not finally settled, to most people's satisfaction, until fourteen years ago — in a tank at the old New York Aquarium.

Up to that time, one or two professional ichthyologists had reported their observations on the Jaculator (*Toxotes*) and had fully confirmed the early stories about it; on the other hand, just as many leading authorities had unequivocally disputed its ability to shoot its prey. For example, Pieter Bleeker and Francis Day, who spent 35 and 25 years, respectively, studying and describing the fishes of Asia, both denied to *Toxotes* any extraordinary powers.

They were undoubtedly partly misled by the fish's rather ordinary appearance, for although to a fish taxonomist it has a characteristic body-shape, to the layman it presents no outstanding features and even the expert finds no external peculiarity indicative of its spitting ability. The mouth is not long and tube-like, as might be expected, nor are there any apparent valves or water-propelling mechanisms. Perhaps this is why the two medical men responsible for the first detailed account of the Archer Fish, wrote a remarkably accurate description of its mode of life — and then attributed all this to another, completely different species. The fish they falsely credited with being able to shoot drops of water

was one of the marine butterfly-fishes, now called *Chelmon rostratus*. It possesses a fine, tubular snout, just the kind of mouth one would imagine a water-spitter to have. When it was later proved that *Chelmon* could not possibly be an insect-shooter, since it lived in and about coral reefs, where there would be no opportunity whatsoever to exercise such a faculty, the whole story of the Jaculator was discredited. Widespread belief in its existence did not come about until relatively few years ago.

Seeing is believing, the old saw goes, and it was Curator-Aquarist Christopher W. Coates who made it possible for thousands of people to see the Archer Fish in action. To him and to Dr. Hugh M. Smith, Adviser in Fisheries to the Siamese Government, we largely owe the present-day universal recognition of the abilities of the *ikan sumpitan* or blow-pipe fish.



On the target! These photographs are part of the slow-motion picture made at the Aquarium by Pathe, under the direction of Mr. Coates.

For many years Curator Coates had tried to obtain specimens of Archer Fish for the New York Aquarium. Professional and amateur collectors, sailors and sea-captains, business men and missionaries, anyone traveling out to southeastern Asia was informally commissioned to send back or bring back an Archer Fish. Informally commissioned, because it hardly seemed practical to finance an expedition simply to go out and capture so elusive a creature. Who knew positively that if caught, it would turn out to be able to do all things credited to it? Then, too, perhaps it was one of those fishes that refuse to live in captivity. The latter seemed a distinct possibility when, time after time, letters or messages arrived at the Battery, telling of the brave start that such and such a number of fine, healthy Archers had made on the long journey to New York, only to be followed by the sad news of their untimely demise somewhere between Singapore and Ceylon, Bombay and Gibraltar or, even worse, Hamburg and New York.

Finally in June of 1935, two specimens of *Toxotes* arrived at the Aquarium. They were, as Curator Coates put it, "much the worse for wear," but they were alive.[1] Nursing them back to health called for all the art and skill of the fishman. No fish that ever came to the Aquarium received more studied, artful care.

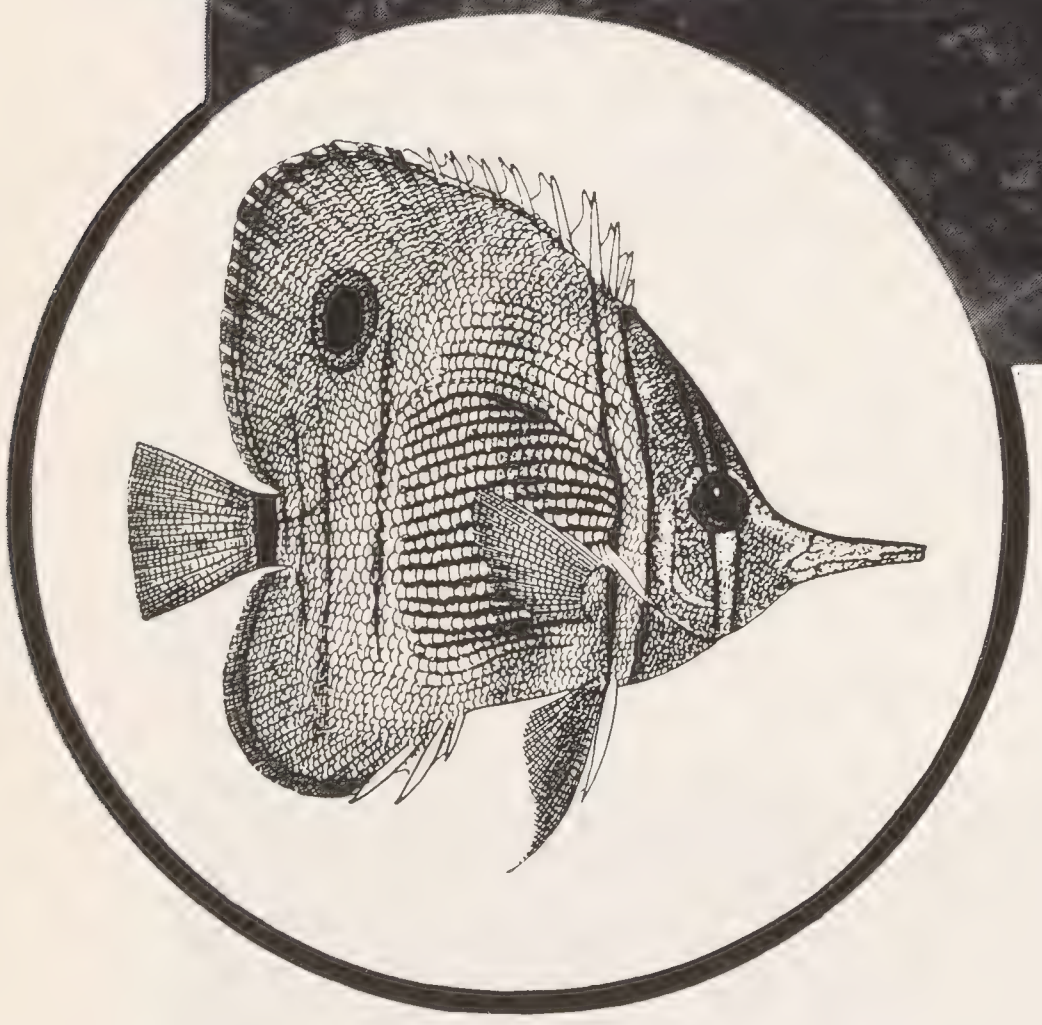
And no fish ever better repaid those who cared for them, either. After ten days in a hospital tank, they responded to the spiders, cockroaches and blow-flies that Curator Coates presented to them, by laying down a barrage of water drops, all but the first of which were bull's eyes. When

[1] C. W. Coates, *Bull. N. Y. Zool. Soc.*, vol. 38, no. 4, p. 144, 1935.



As the spider falls, the Archer Fish leaps part of the way out of the water and snaps up its prey—thus making doubly sure of its meal!





ABOVE — This is the actual Archer Fish, which in external appearance gives no indication of remarkable shooting powers. LEFT — Early naturalists mistook this Butterfly Fish for an archer, because of its mouth.

(Butterfly Fish from Weber & de Beaufort)

placed on exhibition, they amazed both visitors and scientists with the power as well as the accuracy of their shots.

Like everyone who has studied Archer Fish, Curator Coates has come to consider them among the most intelligent-appearing and acting of all fishes. He soon discovered, for example, that they would not perform for nothing. If one was presented with a tempting spider or wriggling roach fastened to the end of a stick, it would bombard the prey assiduously, but if no reward was forthcoming – that is, if nothing fell onto the water – it very soon ceased firing. Three successive, fruitless trials like this usually resulted in a complete suppression of the shooting habit. The fish had "learned" very quickly the futility of trying to knock down such food. Now only starving it would induce it to shoot again.

News of the Aquarium's fish marksmen soon reached the Pathé motion picture company. Here, they thought, was a "natural" for a newsreel topic. Arrangements were made with Curator Coates: if he could get the fish to perform before the camera, Pathé would undertake to get some slow-motion pictures of them in action. This was long before the days of stroboscopic photography, so that only the sun at its brightest could provide enough light for the special filming. To meet this requirement, a tank was set up on the roof of the Aquarium, overlooking New York Harbor. Now it was up to Curator Coates to get one of the Archers to feel at home inside the tank—so much at home that it would perform in spite of a frightening atmosphere of whirring cameras and bustling camera-men. This was not an easy task;

exasperation ran high and patience low before the job was completed. But it did get done, and although the results were not photographically ideal, the newsreel releases throughout North and South America and Europe proved to thousands of people, including not a few skeptical scientists, that the Archer Fish really can shoot.

Just how it accomplishes the feat was first explained by Dr. Smith[2]. Running down the middle of the roof of the mouth of *Toxotes* is a narrow groove. Beneath it lies the tongue, a structure that in fishes is ordinarily fastened down tightly to the floor of the mouth. In the Archer Fish, however, the tongue can be raised somewhat and is completely free at its front end. When applied to the roof of the mouth against the aforementioned groove, it creates a thin, straight tube. The free tip of the tongue is flexible and undoubtedly acts as a valve. By holding an Archer Fish in the water at approximately its natural shooting attitude and quickly forcing its gill-covers down against its sides, Dr. Smith was able to eject drops of water out of the fish's mouth for distances of three feet.

Still unexplained, however, is the Archer's uncanny accuracy. How it manages to compensate for *refraction* is one of the greatest mysteries. We have all noticed how objects in the water are deceiving as to their apparent location, when viewed through the surface at an angle. A cake of soap in the bathtub is one example of this which is familiar to all of us. But this phenomenon must operate in reverse, too, so that looking up through water at an object in air will also make it appear to be at a different spot from where it actually is. We know that *Toxotes* must somehow correct for refraction, because we know its eyes are always under water when it shoots. The fish must also have very keen distance perception, to a degree that only the so-called higher animals were once supposed to possess. Moreover, each time it shoots, it claps down its gill-covers to force water through its mouth, but at the same time forces some water out to the rear, and since this tends to move the fish forward, that movement must be compensated for, too! On top of all of this, there are the ripples and other disturbances of the surface!

Despite all these complicating factors, Dr. Smith found Siamese Archers almost 100% accurate at distances up to four feet. To achieve such precision the fish must possess "a truly remarkable trigonometric range-finder in his brain to cope with the ever-varying distortion of angles, sizes, and distances."[3]

It might also be expected that the eyes of so accurate a marksman would be specially contrived. Yet detailed examination has revealed no specialization at all. In fact, compared to some other fishes' eyes, those of *Toxotes* seem less well-constructed for sharp vision.

SIX DIFFERENT SPECIES of *Toxotes* are generally recognized. They live mostly in brackish water, but occasionally are found in fresh. They occur in coastal areas from India to the Philippines, as far south as Australia and as far east as the Solomons and New Hebrides. The best known species is *Toxotes jaculatrix,* which attains a length of slightly over 10 inches, most adults not exceeding 8.

Nothing is apparently known about its breeding habits, save that it undoubtedly lays eggs and that the newly hatched young appear in parts of Siam in May. When only an inch long, they have already started shooting. "It is most amusing," states Dr. Smith, "to see the inexperienced youngsters emulating the actions of their parents and sending out tiny drops that may go only 2 or 3 inches." Adults, in contrast, have been known to propel drops twelve feet above the surface of the water. The short-shooting babies subsist, of course, on small prey found in the water; adults feed on aquatic as well as air-dwelling creatures. One adult was observed to shoot down a small lizard, sunning itself at the point-blank range of a few inches above the water. Although the reptile was seized when it fell, it is doubtful that it was actually eaten, since the Archer's mouth is too narrow to pass such large prey.

One of Dr. Smith's Siamese friends built his veranda over water that abounded with Archer Fish. "On two occasions to my personal knowledge," writes Dr. Smith, "when my friend sat on the veranda . . . smoking . . . his attention was attracted by well-directed shots which extinguished his cigaret."

[2] H. M. Smith, *Natural History,* vol. 38, no. 1, pp. 3-11, 1936; *Bull. U. S. Nat'l Mus.,* No. 188, pp. 489-498, 1945.

[3] G. L. Walls, *Bull. Cranbrook Inst. Sci.,* No. 19, 1942.

As the Camera Sees Them

Photographs
by
SAM DUNTON



The Indian Leopard-cat of southeastern Asia has a reputation for fierceness out of all proportion to its size, for it is scarcely larger than an ordinary House Cat. It is a rare individual that becomes tame to any degree. The Leopard-cat is a forest-dwelling species, feeding on small mammals and birds and making its lair in a cave or under an overhanging cliff. This specimen, now living in our Small Mammal House, is in a relaxed, yawning mood.



One of the lowliest of the Primates is the Slender Loris of the forests of southern India and Ceylon — a kitten-size creature with soft gray fur and slender, almost skeletal, limbs. As its comparatively enormous eyes indicate, it is a night-roaming animal and during the daylight hours it is likely to be curled into a tight ball, asleep. Awake, its movements are always slow.





A particularly handsome snake is the Emerald Tree Boa of northern South America, a big specimen of which might be five or six feet long. It is a vivid leaf green with markings of shining white. Typically, as in this photograph, it clings to a branch by a series of loops. Its color and markings make it difficult to see in a tropical forest, among leaves and spots of sunlight.





Yaks have been domesticated for so long in Tibet and neighboring countries that hornless and even piebald strains have been developed. In 1913 the Zoological Society acquired a pair of wild-bred Yaks, large of size with fine horns and lustrous black coat. Many fine animals have been bred from this original pair. We now have two excellent specimens in the Zoological Park.

— This animated little animal is the so-called Crab-eating aque of southeastern Asia. It has a variety of other names e Kra (presumably from its cry), the Long-tailed Macaque, less glamorously, simply the Common Macaque. Appar- it does have the un-monkeylike habit of eating crabs and l-fish. Usual food of macaques is fruit, roots and the like.

The Shy Australian Water Rat

By DAVID FLEAY

If one is thinking in terms of furred animals, Australia at once conjures up visions of the homeland of the pouched animals and "living fossil" egg-layers such as the Platypus and Echidna. However, contemplation of the handsomely furred Water or Beaver Rat, *Hydromys chrysogaster* (literally, water mouse, yellow belly) with its unique specialization for an aquatic life, drives home the fact that true rodents obviously entered Australia at quite an ancient time, for the remarkable adaptation of the Water Rat to its river and swamp life has evolved almost entirely within the southern continent. It is just as peculiarly an "Aussie" as any of the Australian marsupials; and it is extraordinary indeed, in this homeland of the pouched animals, that there is not among them a counterpart of the Yapock – the Central and South American Water Opossum. It has been left to the rodents to fill the gap.

The Water Rat, of a genus possessing at least eight species and several geographical variants, is a true aristocrat of the rodent family, exceeding a foot in head and body length, with a white-tipped tail of an additional nine inches. The animal is half as big again as a large Brown Rat (*Rattus norvegicus*) and its size is comparable to that of a Ringtailed Possum, so much so in fact that at night it is quite possible to confuse the two animals because of their common possession of a white tail ending.

Over the past ten years the Water Rat's fine, closely furred pelt, usually of a lovely golden brown color with orange ventral surface, has been in increasing demand as a commercial fur skin. Consequently many thousands of the animals are trapped yearly. In 1931 the skins had reached the hitherto unheard of price of 4 shillings each, and the Victorian Fisheries and Game Department was becoming increasingly alarmed at the possible extinction of a valuable fur bearer. By 1941 the Commonwealth authorities had prohibited the importation of all furred skins in order to save foreign exchange and shipping space, and Australian Water Rat skins jumped to 124 shillings a dozen – 10 shillings 6 pence for a few square inches of skin. Probably nine or ten dozen skins would be needed to make a lady's coat! In June, 1947, they had skyrocketed to 300 shillings a dozen, with 31 shillings 6 pence the highest price for one pelt. With the virtual disappearance of the animals from many of their old haunts, particularly along some stretches of the Murray River and its tributaries, and even young animals being destroyed, the Fisheries and Game Department of the state of Victoria did the only sensible thing by eliminating the open season and placing a total ban, not only on the trapping of Water Rats in that state, but on the sale of their skins in Victoria. Yet New South Wales and South Australia still allow unchecked killing of the animals – the former state classing them as "vermin." Tasmania permits an open season, but provides protection during breeding months.

Needless to say there is an urgent need for Commonwealth control of native fauna to unify game laws in the interests of conservation. If no general action is taken there is no doubt that the slow breeding Water Rat, destroyed and trapped by every device known, including poison, will eventually be wiped out.



The female Water Rat captured by Mr. Fleay while he was searching for Duck-billed Platypuses, was gray with white underparts — the predominant color type around Healesville.

In former times it was the American Musk Rat or Musquash that headed the list of furs imported to Australia from the United States. Being very popular, it is evident that this animal formerly acted as a buffer between the Australian Water Rat and the fur trade. The Musk Rat is similar in its general ways and feeding habits to our Water Rat, but it is larger, and shows a like specialization for an aquatic life, going further, however, in the development of its remarkable paddle tail, flattened from side to side for the terminal third. I remember that paddle tail very vividly, for in June, 1947, it was by this member that I picked up my first Musk Rat running along the sidewalk outside the Boston Road Gate of the New York Zoological Park!

In spite of the heavy toll taken of this American rat it is known to be prolific breeder with up to twelve young in a litter and several litters in a season, so that it holds its own — a thing impossible for the Australian Water Rat with litters of a maximum of four and usually fewer.

The Water Rat is a clean and fastidious feeder and its hunting habits offer interesting avenues of observation. These aquatic mammals are alert and eager killers of fish (eels being particular favorites), fresh water crayfish and mussels and occasionally both young and old of water birds such as ducks, coots and grebes. Years ago on Lake Wendouree in Ballarat, Victoria, I found on a log the sad little skins of three blue-billed ducklings I had been watching only the day before. I have a pretty firm impression, though no actual proof, that Water Rats account for odd baby Platypuses, for there is no sillier and more defenseless youngster than the little Platypus that leaves the nest before it should — as in fact quite a number do. My experience has been that it is difficult to find baby Platypuses at the proper season in streams where the Water Rat has become at all numerous. Strange to relate the chisel-toothed Water Rat finds difficulty in breaking an ordinary hen egg, and such delectable



Triplets were born to the author's pair of Water Rats. At the age of one week, the male was just seven inches in total length and the two females were half an inch shorter.

items of food may remain quite safely in the animals' quarters even though the creatures are hungry. Controversy has centered on this aquatic rat's method of opening such formidable obstacles as fresh water mussel shells without leaving apparent marks of damage.

The most revealing description of such an activity was given me by a fisherman on the Barmah Lakes, Victoria. In 1916 when Water Rats were much more numerous along the great Murray waterway, this man came upon one of these handsomely colored rodents hunting its food in a creek in broad daylight. Using a partly submerged log as a base the rat periodically dived into the water and returned with a mussel. During these under water excursions (when the Water Rat, unlike the Platypus, is guided by eyesight) the observer edged a little closer until, sheltered among the red gum trunks, he was near enough to obtain a clear view. Clambering on to the log with a shellfish held in its teeth, the animal took it in its fore paws and gently inserted its formidable incisor teeth round the edges, working back from each of the two long ends towards the thick hinge or umbo region. In a surprisingly short space of time, with the severing of the creature's adductor and retractor muscles, the two halves of the shell gaped open, and the rat soon ate the soft exposed shellfish before diving again. On another occasion, this same reliable observer watched a Water Rat submerge from a hollow log and reappear with a large shrimp which it ate sitting up, displaying evidence of great enjoyment.

The flattened hind feet and heavy build of the Water Rat constitute quite a handicap on land and in any open space the animal is comparatively sluggish and may easily be caught by hand.

In recent years, a good deal of consideration has been given the possibility of commercially farming our Water Rat in swampy areas leased for the purpose, but not enough account has been taken of the extreme pugnacity of males towards one another, nor of the question of suitable food supply, and the impossibility of preventing outward migration of young. Even in normal life, many individuals have either damaged tail tips or none at all, thanks to nocturnal feuding along the water ways. Having kept some fine Water Rats, on and off in years past,

without ever breeding them, I decided two years ago to try for success by building a special home. The decision was accelerated by the unexpected capture of two of the animals while I was engaged in searching for the three Platypuses, Betty, Cecil and Penelope, destined eventually for the New York Zoological Park. The male Water Rat was one of those lovely golden brown, orange-bellied fellows, while the female, with equally beautiful fur, was merely gray with white under parts; for here in the Healesville district of Victoria the two color types are found in the one locality, with grays predominating.

Never – I caution with deep feeling – allow yourself to be bitten by a Water Rat. Those chisel-like, orange-colored upper incisors and finely pointed, yellow lower ones that open hard mussel shells with such ease, inflict one of the nastiest and most shocking series of bites it is possible to receive. A bite on the fingers penetrates to the bone every time.

A home with swimming tank, landing shelf and a series of protected, grass-lined, wooden "burrows" was constructed for the two Water Rats, and in their honor the affair was named a "Hydromussary." The animals entered it on the auspicious date of Friday, September 13, 1946. Both the male and smaller female were on friendly terms, which was something to be thankful for, considering that males of the species are particularly aggressive towards one another, and even towards a strange female. I have known a male Water Rat to attack another newly introduced male, penetrating its skull with those shocking incisors to such effect that it was killed almost instantly. Fed with crayfish known as yabbies, particularly the tough, spiny, white-clawed, blue species (*Euastacus yarraensis*) of the Yarra River and its tributaries, and fish, the Hydromussary pair maintained sleek shining coats, and like their wild relatives, carried food items either to the landing shelves or into the wooden "burrows" (which replaced the hollow logs they would use in nature) to make leisurely meals. Soon the burows had acquired the absolutely distinctive and peculiar Water Rat odor as characteristic of these rodents as the fox smell is of the fox. If "interviewed" at any time the female took matters quietly; but the male occasionally growled in the prolonged,

A special home for the Water Rats, called a "Hydromussary," was constructed and they lived in it contentedly. It consisted of a tank, landing shelf and grass-lined "burrows."



throaty, snarling fashion typical of the species.

In early October it was obvious that the female had fashioned a definite nest of dry grass at the end of a burrow and here on October 18 she was found with a litter of three babies, already, as we discovered from observations of a later event, six to seven days old. There were an infant male, seven inches in total length, and two smaller females, each six and a half inches long. Their eyes were closed and they were short furred and grayish-black in color, with of course the white tail tip. All exhibited the large, flattened and partially webbed hind feet, the broad nose flattened from above instead of from side to side as in ordinary rats, and the striking array of sensory vibrissae, or whiskers, on each side of the wide muzzle.

The mother stayed closely with her youngsters; in fact, when she moved away from the nest, one or two were usually dragged about by their grip on her nipples (four in number) almost in the manner of young marsupials. Under suspicion of possible sinister designs on such tender infants, the male Water Rat had been removed immediately on their discovery. At the age of 13 days, the young rats' eyes were open, and at 17 days they were already making short excursions about the "burrows," each being quite active, well furred and ten inches in total length. If nursing, however, they were still dragged about when the parent moved. Sometimes I picked the youngsters up, and then, maternal instinct overcoming habitual nervousness, she would rescue them from my hand by taking them in her jaws, and carry them back into the burrows.

Their development was quite rapid, and at 34 days, though only a quarter grown, they were far more active and rapid in their movements than adults of the species. They were inclined to bite, and to all intents and purposes were capable of an independent existence. I removed them to another cage (where incidentally they immediately excavated burrows in the earthen floor) and on that date, November 7, restored the male to the company of his mate. For some hours she resented his reappearance by sustained snarling growls, but ultimately amicable relations were restored.

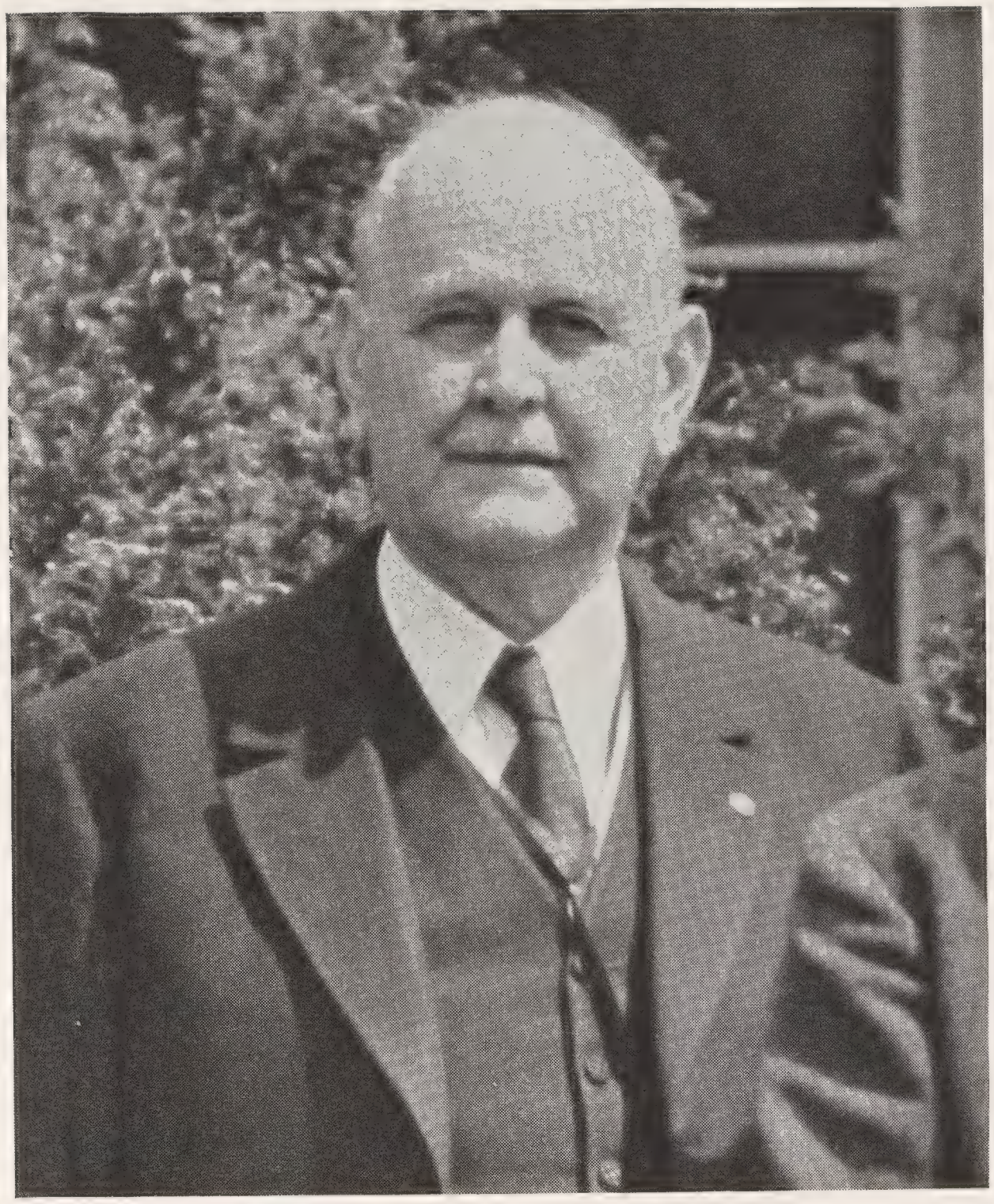
On December 20, just over two months after the birth of the first litter, the mother produced a second family, this time numbering only two. On this occasion I was fortunate in seeing the youngsters on the day of birth. Even allowing for the adult size of the species they were extraordinarily large for newly-born rats, each measuring five and a quarter inches in total length (two inches tail) and weighing an ounce apiece. They were pinkish-red on the under surfaces, pigmented blue-black above, and made noises like a bunch of newly born kittens.

The first litter youngsters was by now nearly half grown, and bit savagely if any handling was attempted. Following the rearing of her second brood, I do not know whether the mother produced a third family in that 1946-47 summer season or not, but it is indeed quite likely as the male rat was not removed, and could easily have destroyed and eaten any further youngsters that appeared. Being very busy and about to leave the country, I was not able to keep the family under the careful supervision so necessary in such cases.

From the evidence accumulated here and from the size and therefore readily judged age of young Water Rats found in the streams in the months of March, April and May, I think it can be safely assumed that under good conditions these animals produce some three litters during spring and summer, varying from two to four in number.

Before the imposition of a total ban on trade in Water Rat skins, in Victoria, protection was afforded them from August 1 to April 30 to cover the breeding and period of immaturity of the young, but it is definitely desirable, in view of the position of this species today, that all states afford the animal protection at least during the spring and summer months – or better still, total protection for several years. Such a matter can only be unified by Commonwealth action.

Whether commercial breeding could be made to pay under conditions of the Hydromussary I have described, is doubtful in view of the small litters produced, but at least selective breeding for better skins could thus be carried out. It is the only method possible – "farming" in open areas being impracticable and already having been attempted in Tasmania. At least by breeding of captives, the wild "beaver rats" could be left to their own devices to re-establish a hold in habitats where their tenure is now precarious in the extreme.



W. REID BLAIR

In Memoriam

THE PASSING OF W. Reid Blair on March 1, 1949, marked the close of nearly a half century of devotion to animal life in its various manifestations. As veterinarian, conservationist and educator, Dr. Blair accomplished outstanding achievements in each of his chosen fields.

Born in Philadelphia on January 27, 1875, he spent his early boyhood in that city. When he had reached the age of about ten years, his family moved to Massachusetts. There, on his grandfather's farm, an interest in animal welfare quickly developed and resulted in his matriculation in the Veterinary College of McGill University, from which he was graduated in 1902, with an honorary LL.D. following in 1928. In the year of his graduation, Dr. Blair came to the Zoological Park as assistant to Dr. Frank H. Miller, a distinguished veterinarian then functioning on the staff. In 1903, following the resignation of Dr. Miller, Dr. Blair was appointed to the post he subsequently occupied with such notable ability. His work as veterinarian of the Zoological Park continued until 1922, when he was appointed Assistant to the Director. This was followed two years later by advancement to Assistant Director. On June 1, 1926, after the retirement of Dr. William T. Hornaday, Dr. Blair became Director, a position he filled with dignity and distinction until he retired, in turn, on May 1, 1940.

During his early days in the Zoological Park,

Dr. Blair devoted himself to pioneer work in comparative veterinary medicine that produced important results. His first paper, published in the *Annual Report* for 1902, on "Modes of Tubercular Infection in Wild Animals in Captivity," was followed by numerous others. Most important of these were "Internal Parasites in Wild Animals" and, with Dr. Harlow Brooks, "Osteomalacia of Primates in Captivity." A book in more popular vein, under the title "In the Zoo," published in 1929, contains much factual and anecdotal material gleaned from experiences in the Zoological Park and furnishes an excellent gauge of the breadth of the author's interests.

In spite of the pressure of official duties, Dr. Blair found time to act as Professor of Comparative Pathology in the Veterinary Department of New York University from 1905 to 1917.

In 1917, he was commissioned as a Major in the United States Army. As Chief Veterinarian of the 4th Veterinary Corps, he served in France and Germany, receiving his honorable discharge in June, 1919.

Following his appointment as Director of the Zoological Park, Dr. Blair's activities turned naturally to broader fields. He was determined that our institution should be regarded as an educational rather than a purely recreational undertaking and firmly guided our endeavors in that direction. He became deeply interested, too, in the conservation of endangered fauna and in 1938 was made Executive Secretary of the American Committee for International Wild Life Protection, a position which he retained until late in 1946.

During Dr. Blair's incumbency, the collections of the Zoological Park prospered and many fine species were added. One of his first actions after assuming the Directorship was approval of the Zoological Society's expedition to New Guinea, which finally reached the field in 1928, with the result that our collection of Birds of Paradise held first rank for many years. Dr. Blair himself visited Antwerp in 1937 and returned with the first and so far the only living Okapi to be seen in this country. In 1933, he secured "Doreen," our Bongo, an animal of rarity almost equal to that of the Okapi.

Dr. Blair was a genial, social, outgoing person, greatly loved by friends and associates. To the end of his life he maintained a keen interest in the Zoological Society, attending all its membership and scientific functions, and his presence will be greatly missed. — Lee S. Crandall.

News from the Conservation Foundation

President Osborn Takes Part In M.I.T. Convocation

Fairfield Osborn served as a panel-member at the convocation held at the Massachusetts Institute of Technology at Cambridge, Massachusetts, from March 31 through April 2. These ceremonies were in connection with the inauguration of the new president at M.I.T., Dr. James Rhyne Killian, Jr., who succeeds Dr. Karl T. Compton.

The first two days of the convocation were devoted to discussions of important world problems, their central theme being, "The Social Implications of Scientific Progress." On March 31 two speakers addressed the convocation on the subjects of the present states of science and of society. April 1 was devoted to six panel discussions of specific world problems. Two dealt with material questions, one taking place in the morning and the other in the afternoon; the first discussed in general whether advanced applications of technology could outrun the threat of increasing world populations and decreasing world resources; the second, the problems of developing "backward" areas. Another pair considered spiritual questions, the morning session having been devoted to Science, Materialism, and the Human Spirit, and the afternoon session to the Role of the Individual in a World of Institutions. The third pair, also divided between morning and afternoon, discussed first the question, Is Twentieth Century Higher Education Overspecialized, and secondly the appropriate relations between the State, Industry, the Individual, and the University, centered on the relations between financial support and independence.

Mr. Osborn took part in the panel devoted to the first of the material questions, the problem of population and world resources. Other members of this panel included Sir Henry T. Tizard of the British Ministry of Defence and former president of Magdalen College, Oxford; Dr. Vannevar Bush, president of the Carnegie Institute, Washington; Dr. Frank W. Notestein, a leading demographer and Director of Population Research at Princeton University; and Robert P. Russell, fuel authority and president of the Standard Oil Development Company.

In his letter of invitation to Mr. Osborn, Dr. Compton wrote in part as follows:

"It seems to me a significant thing that an institution such as ours should give public consideration at this time to the consequences of the professional activities which we expect our students will pursue. But the consideration will be significant only if it comes from persons whose thinking about these matters has been distinguished. For this reason, and with full recognition of the busy schedule you have, I sincerely hope you will find it possible to be with us."

President Speaks at Yale and at Mt. Holyoke

Fairfield Osborn was the principal speaker at the annual banquet of the Yale chapter of Sigma Xi, national honorary scientific society, on March 26, at the Sheffield Scientific School, Yale University.

Mr. Osborn spoke on the urgency of conservation education at university and college levels.

On the evening of March 3, he was the guest of the Science Department of Mt. Holyoke College, South Hadley, Massachusetts, speaking to both faculty members and the student body. The audience of some 900 people included guests from Amherst, Smith and other colleges in the Connecticut Valley area.

Snider Makes Western Tour

Robert G. Snider of the Conservation Foundation has recently returned from a comprehen-

(*Continued on Page* 63)

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

Blizzard Was Destructive to Western Wild Life

Enormous losses of western wild life may be expected as a result of the deep snow conditions this past winter, and some idea of what has been happening in Wyoming is given in a letter to President Osborn from James R. Simon, director of the Jackson Hole Wildlife Park.

Writing from Cheyenne on February 19, where he had been snowbound for two weeks and unable to return to the Wildlife Park, Mr. Simon said:

"A real crisis exists. The weather subsequent to the January blizzards has been far more disastrous in its effects on the game throughout the state; well-informed people believe that we shall lose 60 per cent. of the antelope and 40 per cent. of the deer in Wyoming. Thousands of antelope are already dead, hundreds are dying. It will be late spring before an accurate inventory can be taken."

Mr. Simon had learned by telephone that conditions were good at the Wildlife Park and the animals were being fed daily. The Park's staff was completely snowbound and unable to get supplies, but had enough for about two weeks, and it was expected that the roads would be open in a few days.

Dr. Gordon Collecting Platyfish

Dr. Myron Gordon, geneticist of the Zoological Society, left New York on March 8 for Belize, British Honduras, on a platyfish-collecting expedition. These small fresh-water fishes are being studied in the Society's Aquarium Genetics Laboratory in a research project aimed at clarifying the nature and the origin of cancerous pigment cell growths. When found, the live platyfish will be flown to New York for testing in the laboratory. Dr. Gordon will be aided during his month's survey by the Rev. Gerald Fairweather of Belize, and will return about April 10. Some of his results from last year's collections of platyfish from the rivers of southern Mexico will be explained in a subsequent number of ANIMAL KINGDOM.

Our Farm-in-the-Zoo and the Children's Zoo Reopen

After being closed three years because of construction work on the Bronx River Parkway extension, our Farm-in-the-Zoo will reopen on April 23. The Children's Zoo, which is always closed during the winter months, will reopen on April 9.

Dr. Leonard J. Goss, our Veterinarian, who is charged with operation of the Farm, is still in the process of acquiring stock for its exhibits, and a complete inventory is not yet possible. However, there will be fine examples of well-known breeds of horses, cattle, sheep, hogs, geese, ducks, chickens, goats and pigeons – including what Dr. Goss asserts is the liveliest litter of Spotted Poland China pigs he has seen in years. There are six of the pigs and they were farrowed on March 1. Calves, lambs and newly-hatched chicks will be on hand for the opening, the "Haywagon Taxi" will operate again from the north end of the Zoological Park to the Farm, and the Farm Dictionary (price 2 cents!) will again be on sale.

Nelson Miller, our farmer, and John Gallagher, his "hired man," will take care of the livestock and explain farm operations to visitors. Mechanical milking demonstrations will be held each afternoon, the earliest at 3 P.M. and subsequently at half-hour intervals, the number de-

pending upon the number of milch cows on exhibition.

All the old favorite exhibits, including the Play Ring, the Mouse Village, the Piglets' House and the Wishing Stone, will be seen again this year at the Children's Zoo. An attractive new feature is an "Animal Garden" fence on the south side of the Children's Zoo, next to the Zoobar. It was designed and painted by Mrs. Helen Damrosch Tee-Van. Mrs. Corrine Dalsgaard will again be "Zooperintendent" of the Children's Zoo.

Summer Research Fellowships

This summer for the third year Research Fellowships in the Zoological Park have been established by the Zoological Society, the work in animal behavior to start on June 15 and continue through September 15. The program will be under the general direction of Dr. C. R. Carpenter of Pennsylvania State College. Announcement of the fellowships has been made widely, in colleges and universities and in scientific publications, and the Fellows will be selected from applicants with Ph.D. degrees in physiology, zoology, biology, ecology, psychology or related fields, with special interest, experience and publications in animal behavior.

This summer for the first time a Veterinary Fellowship will be offered in the Zoological Park, from June 15 through September 15, under the direction of Dr. Goss, our Veterinarian.

Snider in West

(*Continued from Page* 61)

sive trip through the West and Southwest, studying conservation problems in the field.

Leaving February 12, he went to Denver to attend the annual meetings of the Soil Conservation Districts Association, March 15-17. In Salt Lake City, Ogden and Logan, Utah, he discussed the proposed Utah range and watershed problem with authorities at Utah University and Utah State Agricultural College. Mr. Snider also visited Albuquerque, New Mexico, and spent the remainder of his trip in Texas and Oklahoma studying watershed and grazing problems of the Washita Valley. He returned to New York March 1.

Home With a Bag of Snakes

Brayton Eddy, Curator of Reptiles and Insects, returned on March 14 from a two weeks' collecting trip to South Carolina, his third excursion in that area. He brought back 23 snakes, including 11 Rattlesnakes, and a smaller number of lizards. Many insects were collected for spring exhibition in the lobby of the Reptile House. Five of the Rattlesnakes were very large specimens, approaching 6 feet in length.

PUBLICATIONS OF INTEREST

THE LIFE STORY OF THE FISH. HIS MORALS AND MANNERS. By Brian Curtis. xii + 284 pp., 34 fig., 6 pl. Harcourt, Brace, New York, 1949. $3.75.

This is, I believe, the best popular book in English ever written about fishes.

Having proffered this encomium, there remains little more to be said, save perhaps to justify it. Brian Curtis was ideally trained to write this kind of book: he has been a professional writer as well as a student of fishes, both in the laboratory and the field. Moreover, he has the happy faculty of being thorough without being ponderous, accurate without being pedantic, and humorous without being flippant.

We are glad this new edition has been prepared, if for no other reason than that it once more gives us a book wholeheartedly to recommend to the layman who wants to buy a book and "learn all about fish." The original work of ten years ago has been corrected, brought up to date, revised and expanded throughout. This is not just another reissue of an old text. For example, a whole new chapter on the conservation of food and game fishes has been added. The new list of Selected References should prove invaluable to those wishing to pursue their reading further.

Errors? Yes, we noted one or two, but was there ever a book absolutely free of them? The only thing we would really quarrel about is the book's inept sub-title. — J. W. A.

FISHES OF THE WESTERN NORTH ATLANTIC. Part One. Lancelets, Cyclostomes, Sharks. By Henry B. Bigelow, William C. Schroeder and Isabel Pérez Farfante. Pp. xvii + 576, 106 illus., 2 maps. Sears Foundation For Marine Research, Yale University, 1948. $10.00.

The first volume of this long-awaited and badly needed reference work has at last come to hand. Its preparation was started more than ten years ago, but work on it had to be discontinued for a period during the war.

This beautifully illustrated, printed and bound volume is the first of a series and is concerned solely with the lancelets, lampreys and hags, and sharks of the region, which includes not only the area named but all the adjacent gulfs and seas, from Hudson's Bay to the Amazon River. It is not merely a description of the species in these groups, nor a listing of scientific papers and books, but a critical review and evaluation of all that has ever been discovered and reported about them. Written with a minimum of technical terms and phrases, it may be read as well by the interested layman as by the scientist. In fact, by skipping the purely taxonomic

sections, necessary in such a work, it makes fascinating reading for anyone, for it discusses every aspect of the lives of these creatures, including their danger to man and their value in commercial and sport fishing.

The Society can well be proud of the prominent role it has taken in the conception, development and prosecution of this definitive monograph. John Tee-Van is its Editor-in-Chief, and much credit is due him for the excellence of the work. The Aquarium's Research Associate, Dr. C. M. Breder, Jr., is another member of the Editorial Board, and Dr. William Beebe is on its Advisory Committee. — C. W. Coates.

New Members of the New York Zoological Society

(Between January 1 and February 28)

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Lt. Thomas N. Cross
Harmon H. Goldstone
William E. Hutton

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In 1899

There were only 767

BACK IN THE YEAR when the Zoological Park opened — 1899 — the Society had a membership of only 767. We have nearly five times as many today . . . but we still are not as strong in membership as we should be.

In this our fiftieth anniversary of the Park, it would be a magnificent achievement if every member would send us one more. Please send us names and we will follow them up.

MEMBERSHIP CHAIRMAN
NEW YORK ZOOLOGICAL SOCIETY
30 East 40th Street
New York 16, N. Y.



LII · No. 3 MAY – JUNE, 1949

ANIMAL KINGDOM

SMITHSONIAN INSTITUTION
JUN 1 - 1949
NATIONAL MUSEUM

THE MAGAZINE OF THE NEW YORK ZOOLOGICAL SOCIETY

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ANIMAL KINGDOM

BULLETIN OF THE
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East of the River

A FEW YEARS AGO the first step was taken in the development of the area of the Park lying east of the Bronx River. The Farm-in-the-Zoo was installed and has steadily proved a great addition to the services of the Society to the public. Newspaper reporters who know our big city have told us that they would estimate there are at least two million people in New York who have never heretofore had the opportunity of seeing domestic farm animals. The Farm-in-the-Zoo fills a real gap for city dwellers.

The next step is that of the creation of the Conservation Exhibit on the twelve acres of land that lies in the very northeast corner of the Park. We have been working on plans for this for a number of years now, and only the other day received extremely reassuring news from Albany to the effect that Governor Dewey had authorized the expenditure of initial funds for this project. Consequently, it is expected that construction work will begin shortly.

This exhibit will be a pilot project of national importance. There is no other such conservation demonstration anywhere else at this time. It is anticipated that the exhibit will teach the need for conservation to as many as 300,000 to 500,000 visitors each year. It will prove a teaching center for school and college groups. Further, it will serve as a model for other similar conservation teaching centers in densely populated areas throughout the nation.

Fairfield Osborn

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(Photographs by Henry Goldstein, Belgian Congo Information Service)

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MAY 31 1949

Llanos Sanctuary

Life Around A Venezuelan Water Hole

By
WILLIAM BEEBE



Several notable gatherings of animals have been recorded in the literature of man. Adam performed the functions of a very pre-Linnaean taxonomist when he gave names to all the creatures of earth as they passed in review in the Garden of Eden. Noah, in his Ark, preserved the fauna of the planet when "the animals went in two by two." Then we have the Society's Zoological Park, which combines the advantages of the above-mentioned collections in having adequate labelling and satisfactory preservation from drowning. I have just seen what, in my experience, is a fourth Greatest Show on Earth. The place is a water hole in the heart of the Venezuelan llanos, the time is early April, almost the last day of the dry season.

In difficulty of access the llanos share honors with the South Pole; in lack of detailed study, they are unique. They are one part of the earth for whose desolateness man cannot be blamed. In April they are accessible by car through a horizon-wide dust bowl; in June on mule-back through fathomless mud and mire; in August only a boat or amphibious truck can penetrate.

We chose the first. Leaving Rancho Grande in early morning we reached our objective, the great Rancho Piñero, in ten hours of almost continuous driving. From Rancho Grande through Maracay, Valencia and on to the Carabobo battlefield was a wide cement highway.

The rest was so-called roads of second and third classes, over trails on open plains, whose ruts, gullies, dust-filled embankments and half-concealed sudden drops should have required six spare axles. Somehow we came through without mishap. The clouds of dust seldom permitted a glimpse of our truck which loitered ahead of us in case of need. It was laden with our cots, hammocks, food, water and an aluminum boat, the latter an absurd item as glimpsed now and then through the dust. More than once, in spite of its six huge tires, it almost heeled over. We passed through Tinaquillo, Tinaco, El Pao and Las Yaguas, and finally, well to the west and more than one hundred miles nearer the equator, we drove into the courtyard of El Piñero. Thanks to our friend Armando Planchart and to the President of the State of Cojedes, the ranch, hundreds of square kilometers in extent, had been placed at our disposal.

The great ranch-house and its surroundings and the mode of life of the inhabitants should



Llanos are level, open, grass-covered plains with scattered palms, flooded in the rainy season, covering vast areas in central Venezuela.

have a whole chapter to themselves, but this is a brief report on one phase of the concentrated animal life of the llanos.

Ten minutes from the ranch was Laguna Grande, a quarter-mile expanse of shallow water, half filled with floating hyacinths in full bloom. Short as was the distance, only the truck could make it. The clay had been everywhere churned up by the hooves of herds of cattle in the rains, and now was caked into iron-hard cobbles which would have broken up our Chevrolet in a few yards. We had to ride standing on our toes and carrying cameras and glasses to lessen the impact. The scenery en route was typical llanos, absolutely flat, with burned grass stubble, and dotted everywhere to the horizon with widely separated palms. The hot air was breathless and the only thing in motion was an occasional dust devil, its whirling base sucking up dust, and spinning it out into a heaven-topped, twisting column.

The lagoon appeared as an emerald circle, covered with masses of many colored blossoms. Some distance away we stopped the truck and unloaded the great binoculars and their tripod. The lagoon rushed to arm's length and the inflorescence turned to birds. The lagoon was a gigantic duck-pond. Hundreds upon hundreds of creamy-white flowers became the heads of white-faced tree ducks held aloft on stem-like necks. Muscovy ducks and scarlet ibises added black, white and flaming red. A score of dark bushes took to wing, and changed from shrubs to balloon-light horned screamers, sending forth their liquid trumpet notes. A quartet of black skimmers was a complete surprise, ploughing their wakes through the water of this isolated lagoon as they would off the shores of New Jersey.

Laguna Grande was a real sanctuary in the heart of this vast land of drought, but it was only a curtain raiser. An hour away from the rancho we came to the backwater of the Rio San Geronimo, after a long, indescribably rough ride in the truck, ending at two scanty lines of trees and bushes. As we carried our boat and duffle down to the water's edge, two very much annoyed *cimarrones* or feral bulls and their harems of six and eight cows stampeded across ten yards of as green slimy water as I have ever seen. The air was filled with a cloud of fluttering, squawking birds, from great jabiru *soldados,* to tiny jacanas and sunbitterns. All drifted down stream and alighted within sight.

To this thirst-enforced flying cage we came every morning of our stay; we looked and wrote and exposed our color films, and longed for weeks instead of days. To this isolated stagnant backwater came every class of vertebrate, driven and held day and night by the need for water. I watched every movement, every flicker of eye of the largest iguanas and tegus I have ever seen. Three jaguars had recently been killed here, and we saw tracks of others. The greatest worry we had were the solitary, morose-tempered bulls. We never sat for any length of time in any one place without first picking out an accessible branch, just in case one of these light-footed giants should develop resentment at our presence.

We alternated in the use of the boat; either Jocelyn would set up her tripod and camera and paddle within shooting distance, or I would mount my tripod and 12-20-40-power glasses and look and write until eyes and wrist rebelled.

Around the first bend arose a sound which I had not heard for decades — the turning of a host of unoiled, creaking hinges coming from a tree full of hoatzins; then more and more until a thousand were in sight at once. I finally had a list of eighty-four kinds of birds living in this confined area, all watched for minutes or half hours from the boat. Occasionally, the light craft drifted against a floating log which became animate, and a six-foot crocodile scrambled resentfully away through the shallows, watched by a score of youngsters. Inconspicuous as they were in the daytime, at night in the darkness their eyes reflected brilliant red from our flashlight, and the green slough became a procession of scarlet planets, large and small, moving slowly along the surface.

Every foot of surface boiled and bubbled in the sunlight from the inexplicable activity of innumerable catfish, and we listed twelve separate methods of capture — a dozen distinct methods developed by as many species of feathered anglers. Hundreds upon hundreds of turtles clung to projecting sticks or to one another, or occasionally appeared in droves from the underbrush, forming roads or mobile mats flowing down the banks. Limpkins and ibises stepped unsteadily over these mosaics of living shells, rivers of brown tiles, for all the world like Eliza crossing the ice. The limpkins, strange, gangling, ibis-like birds, with voices like nothing else than disembodied spirits, were in flocks of many hundreds, where usually they are found singly. Even the monkeys were driven to this thin line of water-side trees, families of great, red howlers and capuchins in bands of eighteen or more. Deer waded in the shallows and watched us unafraid.

After the first, fine optical frenzy of this reversed Noah's Ark of life (a whole fauna looking for water, not avoiding it) we settled to recording the personalities, the interrelations of this aviary. The marvel was their tameness and their disregard of one another. Sandpipers, herons, kingfishers, snail-eating hawks, cardinals, cuckoos, macaws, hoatzins, cormorants, doves and gallinules all got in each other's way, caught fish or flies under one another's beaks and never once did I notice even a hint of irritation. To see five different kinds of birds walk or hop between the stilt-like legs of a sleeping wood ibis or jabiru was to envisage an avian Garden of Eden before the Fall.

Once, on the last day, we went unscientific and argued the relative beauty of each. I think finally it was a photo finish of a dead heat between roseate spoonbills and pileated herons; the one for such unexpected distribution on the plumage of pinks and scarlets, and the other for the reincarnated chaste exquisiteness of the original of a Ming painting.

Flocks of thousands of the primitive, reptile-like birds called Hoatzins, flapped heavily from tree to tree as the boat passed beneath.

Spoonbills were one of a dozen fishing birds, each with its own way of discovering, luring and capturing the unending hosts of catfish.







An aluminum boat in the slimy, half-evaporated backwater of the Rio Geronimo, was an ideal way of observing and photographing.

The morning came when we had to pack and leave. For five hours on the preceding night, after months of drought, the heavens opened, and with a full orchestra of lightning and thunder the rain poured straight down. We were warned that the return trip might not be easy, and this prophecy proved true.

The Great-billed Hawk has discovered the advantages of an omnivorous diet. It feeds on birds, lizards, fish, snails and worms.



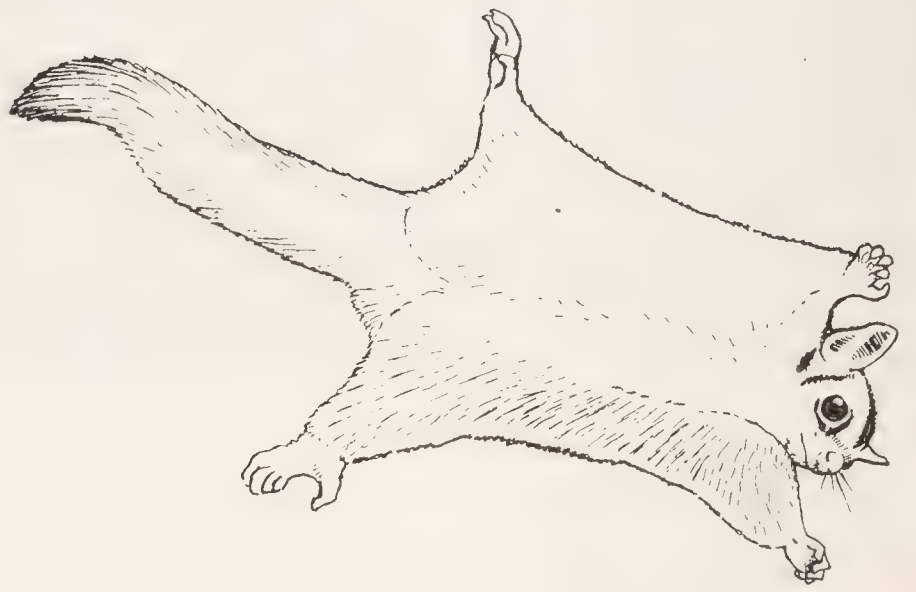
The dust has vanished, returned to earth again in the form of mud, mire, slimy slithering clay. All our route is camouflaged, altered, making us detour into unpredictable llanos expanses, in preference to sinking out of sight. We skid a half circle with a jagged tree-trunk at the hundred and eighty-first degree, and ponder what beside our fender will crash; a score of water-filled ruts appear ahead, six of which must be avoided as their depth would twist off a wheel; mud-clogged alternating gullies lie in wait for our axle; we pass over a spiny palm and wonder how many botanical thorns are working their way slowly toward our inner tubes. We sprint through a rushing torrent and listen for the sputtering death of the engine.

The tenseness and worry of those many hours of the return trip are past. Now we only rejoice that such a splendid world of life is safe, perhaps for years, from marauding human killers in cars. No laws or licenses are needed. For a space the life of the llanos is safe.



Australia's Vivacious Sugar Glider

By
DAVID FLEAY



"EASY TO LOOK AT and delightful to know" is truly an understated description of the beautiful and delicately colored Sugar Glider – most vivacious of Australian tree mammals.

A mere fifteen inches in over-all nose-to-tail-tip measurement, this sparkling-eyed, soft-furred and pink-nosed parachutist is the embodiment of joyous freedom as it skips through the tall eucalypts at night, sipping nectar from blossom, here one minute and fifty yards away the next.

No native mammal or bird is more essentially a part of Australia's grandest bush than this little Sugar Glider (*Petaurus breviceps*). It is at home in diverse habitats but loves the atmosphere of the deep gullies where, amid the aroma of tree ferns, dogwood, musk, hazel and sassafras, stand the towering white gum trunks with their draperies of hanging bark. In the stillness of night the gliders' eager activity is indicated by rapid gurgles, shrill grunts and faint "clop" sounds as they land on hard, smooth bark.

If by some extraordinary chance the habits of Australian mammals were reversed, so that, like squirrels, the Sugar Glider scampered about the bush by day, instead of by night, how charmed and entranced everyone would be with this exquisite and beautiful little creature! But because of its strictly nocturnal activities, it can never be widely appreciated. This "Sugar Squirrel" of the bush people is not only a gem among all its very attractive relatives, but it is the hardiest, most common and most widely-spread, – all of which makes it quite a singular thing that it was not described and named scientifically until 1839.

The Sugar Glider ranges, roughly, from the southeastern border of South Australia through Victoria, New South Wales and Queensland to the Northern Territory and adjacent islands. As one would expect in a species with such an extensive range, several sub-species are recognized. Tasmania is also a "flying ground" of the Sugar Glider, though only by accident of importation from the mainland, having been released in Tasmania just a little more than a hundred years ago.

Not only has the Sugar Glider a wide distribution, but it inhabits all types of country, short of treeless plains, within that range. I have watched it in the densest scrubs and gullies of southeastern Victoria, where towering mountain ash dominates the thick timber, and again among the woolly butts just below the snow gums at the 4,000-ft. line. I have met it among the red gums and box timber ridges of the Murray River. It likes the inland savannah of northern Victoria, and I have seen it in the warm jungles outside Cairns in Queensland and down among the

angophora trees of Mallacoota in Victoria. Its sharp little claws leave innumerable fine, extensive scratches on the trunks of white-barked eucalypts wherever it is found.

As its name *breviceps* implies, this species is the Short-headed Glider. Though quite an unromantic label, the name serves to distinguish it at once from the slightly larger Squirrel Glider.

It is easy to understand why bush people call this dainty creature the "Sugar Squirrel." Country folk often keep it as a pet, and then it demonstrates its phenomenal sweet tooth by tackling jam, sugar, honey, lemon peel, chocolates, boiled sweets, and treacle with consistent greediness. When jam tins are emptied and placed in a Sugar Glider's cage overnight, one is left in no doubt as to the thoroughness of the "lick out," for the inside of the tin is given a perfect polish!

Years ago when friends and I indulged in term holiday "walk-abouts" in a rickety horse-drawn outfit, one of our favorite resorts was the picturesque Mt. Cole State Forest near Beaufort, Victoria. There, one night, we noticed several Sugar Gliders volplaning to the very tree against which our van was backed. We placed a small tin of honey on the roof, and soon after crawling into our bunks, odd scamperings and rustlings came from above our heads. Those lively little creatures licked the platter clean.

It is a pity that the gliders' disposition is not



always as sweet as their appetite. Sometimes they amaze one by their spitfire tempers, their droning, hissing screams, piercing teeth and sharp, tearing claws. As educated pets, however, they have no equals among Australian marsupials.

In one particular great cage thirty feet high, I had at one time a pet Sugar Glider that always put on an act for nocturnal visitors. The little creature usually volplaned gracefully from a high point to an upright of the enclosure nearest the onlookers. He would do this repeatedly until rewarded with a sweet. In daylight, however, whenever I placed him on a twig for the purpose of a photograph he would not pose at all, but jumped onto my Graflex camera and scurried inside the focussing hood to escape the much-disliked daylight.

It is not uncommon to find in this species quite a number of specimens with white tail tips, and reference to a flashlight illustration of a glider group clustered like bees about a jam dish will show several white-tipped individuals among normally colored associates. An anatomical peculiarity of the fore-feet is the somewhat lengthy fourth finger which extends with its claw beyond its fellows. This arrangement is a definite adaptation to the animal's insect-hunting proclivities, and the long claw serves as a special extractor in bringing delectable grubs, moths, spiders or beetles from crevices or holes in the bark of trees. This specialization of the fourth digit is carried to extraordinary lengths in the insectivorous striped possums (*Dactylopsila*) of Queensland and New Guinea. Interestingly enough, this non-gliding genus is thought to have developed from the same ancestral stock (Leadbeater Possum type) as the lesser gliders.

The daylight retreat of the strictly nocturnal gliders is usually a hollow limb or hole in a trunk at any elevation, high or low, and in such havens plentiful eucalypt leaves are gathered to form bedding. Sometimes a temporary home may be found in an unoccupied Ringtail Possum nest built birdlike in tea-tree, native cherry or sapling

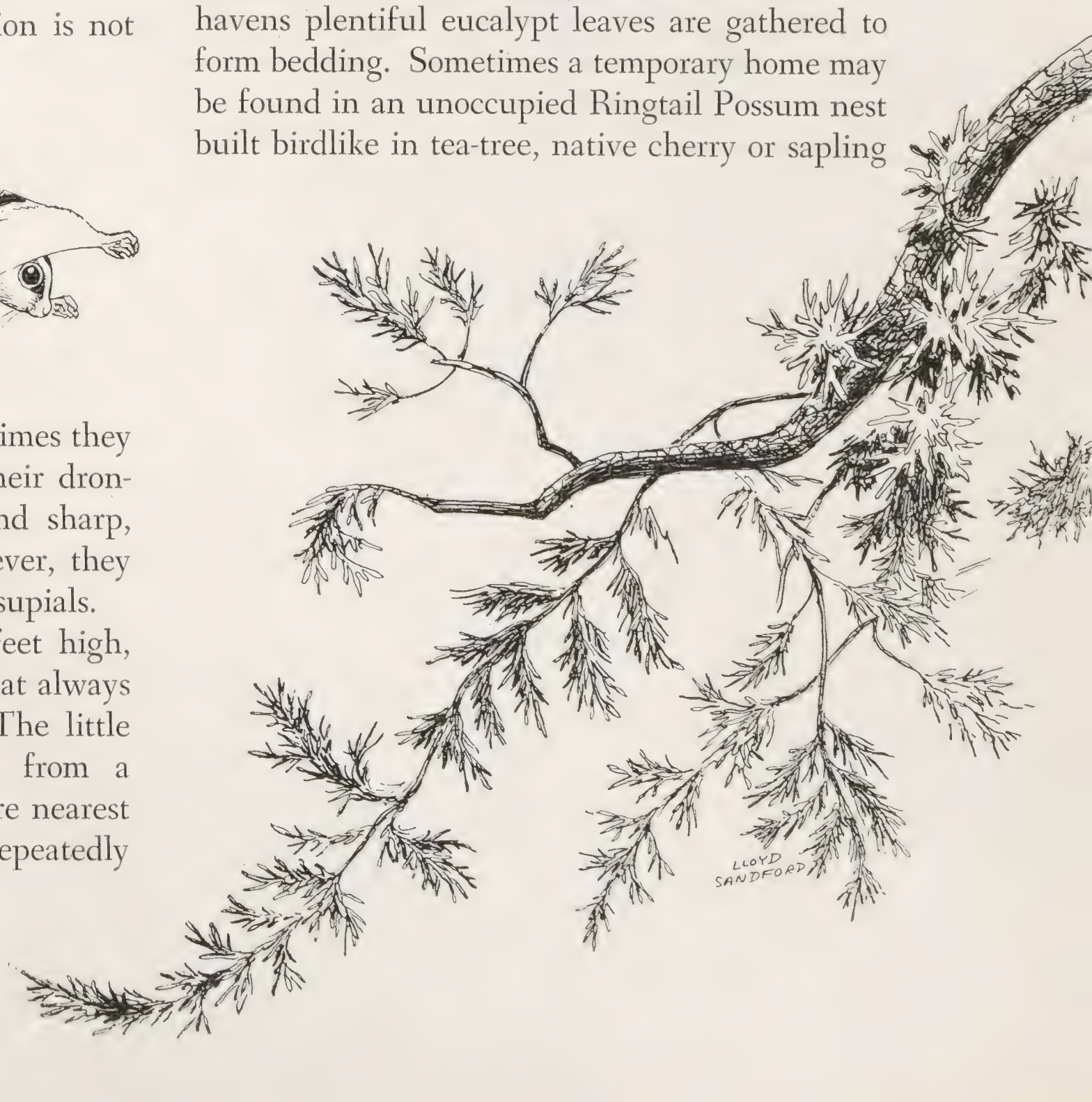




Photo by the Author

Twin Sugar Gliders about nine weeks old have outgrown the maternal pouch but still manage to cling to their mother by claws and teeth. They are still too young to be "on their own."

growth. Oft times as a boy I shook such nests and saw little gray shapes shoot forth with membranes wide spread to frisk up handy trunks to higher regions, with ears back and tails wildly gyrating. In fact, my very first meeting with a Sugar Glider in the stunted secondary forest now clothing the impoverished ground of former goldfield ranges north of Ballarat in Victoria was a doubly painful one. In the Spring of 1921, in a lucky moment, I found an owlet nightjar's nest and eggs some nine feet from the ground in a hollow of a peppermint. It was about five miles from home in bush covered hills. I had to lean a long spar against the trunk in order to ascend, and after swarming up this, it was just possible to gently place a hand within the hollow. On the second trip, I got thus far and gathered up something soft and furry. The nightjar's eggs were gone, and the interlopers set up a most extraordinary screaming and hissing. At the same time maddeningly painful teeth were driven into my fingers. In the general excitement, my perch gave way, precipitating me with a headlong crash to the hard, slaty ground. Simultaneously, three or four gliders jumped out. However, lying in a daze with a rather anxious dog looking on, I found I still had my attacker held tightly in my hand!

All nesting sites of the Sugar Glider possess one characteristic in common — a distinctive odor. While the pretty creatures have no smell in themselves, it appears that urine dampens the bedding material. The mass of leaves and the hollow itself thus acquires an indescribable though rank, gummy and somewhat musky smell. Two or three animals may live together, or a much larger number, consisting often of the original pair with young ones that have remained with their parents after reaching maturity. In far-eastern Victoria, in thick scrub, I found one such family. Rambling through the bush I happened to notice a small hole only two inches in diameter, barely five feet above the ground, in the clear white trunk of a manna gum. It had a well-worn appearance, and a number of soft gray hairs clung to the tiny entrance. Blocking this "doorway" with a handkerchief, I cut into

the lower side with an axe and brought out no fewer than a dozen Sugar Gliders. In this large family there were about five adults, a number of immature but well grown animals, and finally, a very small infant which had just outgrown its mother's pouch and was no bigger than a mouse. The month was January, but the breeding season on Monaro is later than in the lower country, thus accounting for the presence of a number of young marsupials at this time. The leaf nest in the hollow was very large, having apparently been added to for several generations, and the smell was so pungent as to be almost unbearable.

In the poor scrubby timber to the north of Ballarat, where the original forest was very largely felled in the days of the gold boom, there are not many good glider homes — old hollow trees not being at all abundant. Consequently, it is not unusual to find the animals snugly ensconced with leaf nests complete in wood stacks of many months' standing in this timber. I have seen them rudely awakened and scurrying away in all directions when wagons were being loaded to cart the firewood off to Ballarat.

The building of a nest in a camping hollow is accomplished by methods similar in all essentials to those employed by Ring-tailed Possums and by other gliders. When darkness has fallen and additions are required for the nest, animals in my collection run to leafy boughs, which as a rule are continually renewed, and with their sharp teeth sever sprays of leaves from the branches. Usually in doing so they hang upside down. Having secured the leaves, they pass them via the fore-paws to the hind feet, which in turn push the bunch backwards so that the tail is able to take an immediate turn about them. More and more are collected until the animals present a comical appearance with tails twisted

Maternal devotion of the Sugar Glider is demonstrated in this photograph of a female—normally timid—attempting to secure the release of her "Joey" held in the author's hand.

Photo by the Author



so tightly about loads of green leaves. Righting themselves, they may scamper several times about the enclosure, almost seeming to show off, and then, unable to volplane because of the use to which the "rudder" is being devoted, they run lightly along the boughs, pop into the hollow, arrange the material in place and then reappear for more. By the morning following such a nocturnal working bee, boughs are not only stripped of leaves but of bark as well where the gliders have been seeking sap and sapwood. On only one occasion in a long experience in bushland have I seen a wild Sugar Glider at nest-building activities, and that was but the merest glimpse of a shy little gray fellow with a bunch of green leaves protruding from each side of a firmly rolled tail.

The two long, tapering and piercing incisors of the lower jaw are specialized for the work of chewing into the tissue of young branches to get at the starches and sugars of the phloem. So efficient, indeed, are the teeth of the Sugar Glider that it has been known to escape by chewing holes right through the woodwork of cages.

Not being a leaf eater this marsupial, like all the other lesser gliders, is not only a "sap licker" but a nectar seeker and a connoisseur of insect food. The blossom of flowering eucalypts is sought over long distances, for which activities these dainty creatures are ideally adapted by means of their efficient gliding powers and active movements. They are able to search over a maximum area by night with a minimum of effort. Apart from its well known sweet tooth the insect hunting trait of Sugar Gliders is an ingrained habit. On many a night in the bush, faint tearing sounds from eucalypt trunks draws one's flashlight to the busy marsupials removing loose scraps of bark in search of cockroaches, beetles, shield-bearers (*Scutigera*), huntsman spiders, moths and borers. Like the Squirrel Glider, it regards the big creamy larva of Longicorn beetles as a special pièce de résistance. In fact, the work of the Sugar Glider in lifting the bark for insects by night could very well be likened to the busy search of that handsome bird – the Yellow-bellied Shrike Tit, by day.



A camera flash one night caught these Sugar Gliders clustered around a dish of honey - sweetened bread and milk. Several individuals have white tail-tips.

Photo by the Author

There are few spectacles more interesting than that of a bright-eyed Sugar Glider squatting on its haunches on some slender bough and resembling a real squirrel as it chews busily at some luscious moth clutched tightly in both membrane-fringed fore-paws. Its little ears twitch forward at the slightest sound, but the alert creature is loath to budge an inch until the delicacy is devoured, only the wings being discarded. The mere fluttering of a moth anywhere

in its vicinity causes the active glider to prick its ears and leap at the insect, sometimes catching it in mid-air. No true insectivore ever hunted with greater keenness. Occasionally, vagaries of diet take a carnivorous turn. Years ago, I placed a baby blackbird in a glider's cage to safeguard it from marauding cats, and its parents fed it successfully through the wire. For three days the fledgling flourished until one morning I found to my dismay that it was missing. Investigation disclosed the remains of the poor bird lying in the glider's nest, and the little fellows, then so innocently sleeping in several round, quick-breathing, furry balls, had eaten every shred of flesh from the victim's bones!

the bush. However, one of a lot of five which was released during a camp-out in heavy forest between Daylesford and Ballan, Victoria, became the unsuspecting victim of a tragedy. Other wild Sugar Gliders were running about in the overhead trees on the night of release and during the darkness we guessed that all was not well by the sharp, droning, hissing screams, with abrupt rise and fall, floating down from above. Even so, in the morning light it was a shock to find the body of a dead Sugar Glider almost at our feet. There were tooth marks on its neck and the unfortunate little creature was certainly one of those which had so recently been released. On quite a few occasions during night walks through



When a Sugar Glider is "on the alert," every line of its body expresses awareness of possible danger. This little fellow "took off" a split second later.

Photo by R. M. Young

Another pair of these gliders that I have at the moment were annoyed by a mouse that came each night to steal some of their honey and bread soaked in milk. One night they caught that mouse, and taking it up to a neat leaf nest inside a hollow log made a meal of it — only the rolled-back skin and tail remaining.

Though Sugar Gliders are usually found dwelling together in amicable relationships as family groups, they may display clannish vindictiveness. In earlier years they bred so well in my collection that on several occasions I took five and six at a time and gave them their liberty in the bush I have walked in the direction of scolding tree-top gliders, to have the antagonists fall with a thump right at my feet, there to continue furious battle.

In vocal accomplishment both Sugar and Squirrel Gliders are among the most versatile members of the comparatively quiet marsupials. The Sugar Glider possesses a variety of calls, that most often heard being a shrill grunt, yap, or bark, uttered at short and regular intervals on still nights. Curiosity is one of the animal's weaknesses, and it is this, I think, that causes it on frosty moonlight nights to utter the weird

shrill grunts. The little creature scents mystery in the mighty billowing tops of the trees and in the great silent moon.

Almost invariably the presence of a campfire in the bush causes the gliders to commence this toy terrier call. Quite recently on a dark winter night, I happened to arrive under a tree from which a large Powerful Owl was uttering its slow deep call of "woo-hoo!" Simultaneously from close at hand came the "wek! wek! wek!" of a Sugar Glider located only six feet up on a tree trunk, where it clung head down on the side away from the owl's position, uttering its shrill bark in obvious fright at the closeness of one of its natural enemies. The series of notes indicating anger and disagreement has been commented on and this sharp droning scream commences full and loud, rapidly dying down to a few faint grunts. Everybody who has suffered the painful stabs inflicted by the teeth of this glider will remember this angry scream — an inseparable accompaniment of the biting process. Finally, among themselves, Sugar Gliders use a quiet, almost inaudible, series of slow hissing cries that are probably a persisting relic of the immature or baby stage. These notes are occasionally heard from the nest in which the gliders curl up during daylight, seemingly an indication that someone is out of place in the sleeping scheme.

In the southern parts of Australia, the young ones appear in the pouch usually in July or August and the number carried at one time is usually two though three or even a single "joey" are not uncommon. The breeding season, however, is not always confined to the winter months. A female Sugar Glider of exceptional friendliness that I have at present gave birth to two offspring on August 19 of last year. At night she has often paused close beside me on a bough, sitting in an upright position with tail hanging down as she held the pouch entrance open with both fore paws to carefully lick the squirming pink infants.

The gestation period is very short, slightly less than three weeks in fact, and the little ones at birth are more active and practically twice the size of embryo native cats (Dasyures) at a similar stage. Otherwise there is little to choose between them.

Developing at a comparatively rapid rate, the infants grow a covering of short fur by the time they are nearly two months of age, and very soon after this they become too large to be nursed in the pouch and simply lie with the parents in the nest. Their eyes open soon after the desertion of the pouch, and when four months old they begin to rely on their own resources, though still remaining members of the family. Up to this stage and beyond it — and even when quite large — these beautiful young gliders will cling tenaciously to the mother's fur with tooth and claw when danger threatens. Regarding the life span of the species, there is a certain amount of evidence at hand from which to draw conclusions. Several people including Mr. S. Jeans of Drouin, Victoria, have kept the gliders as pets for periods of seven years, and it seems a fair conclusion that the Sugar Glider may live for seven to ten years at the most, particularly as its early life shows a rapid growth with only a four-months period between birth and its ability to live independently.

Owls once were the chief natural enemies of these smaller gliders, but nowadays the depredations of the domestic cat gone wild are serious. On quite a number of occasions, in examining the disgorged pellets of bone and fur below gully perches of the Powerful Owl, I have found broken skulls of the Sugar Glider. The Barking or Winking Owl is also a connoisseur of these "tasty" small mammals. At one time when Sugar Gliders chewed a hole, unnoticed, in the top of a very large cage, fifteen of them escaped and for two weeks, before ten were recaptured, they made merry in our garden, gliding from tree to tree at night and generally visiting their old cage in search of honeyed bread and milk. Tragedy overtook one or two which entered the lofty enclosure of a Boobook Owl and family, and I remember the shock of finding, early one morning, a satisfied Brown Owl drowsily surveying me with head on one side while in the toes of one foot he grasped the hindquarters and tail of one of our pet gliders!

Sugar Gliders are creatures of a romantic atmosphere, a fairyland world almost unreal and unrelated to everyday bushland. When dusk has faded and night descends over the forest, old dry

(*Continued on Page* 95)

ELEPHANT HUNT

Photographed in the field
By
HENRY GOLDSTEIN

Belgian Congo Information Service (Congopresse)



1

Two years ago a new camp of the Elephant Domestication Station was set up at Aru.



2

Monitor Elephants—old and well-trained—are used to "indoctrinate" the youngsters.

SINCE 1900 the Government of the Belgian Congo has maintained a station in the northeast corner of th colony for the capture and domestication of Elephants. The project stemmed directly from King Leopold I While he was still Duke of Brabant, he made a journey to Ceylon where he was greatly impressed with th practical use made of Asiatic Elephants.

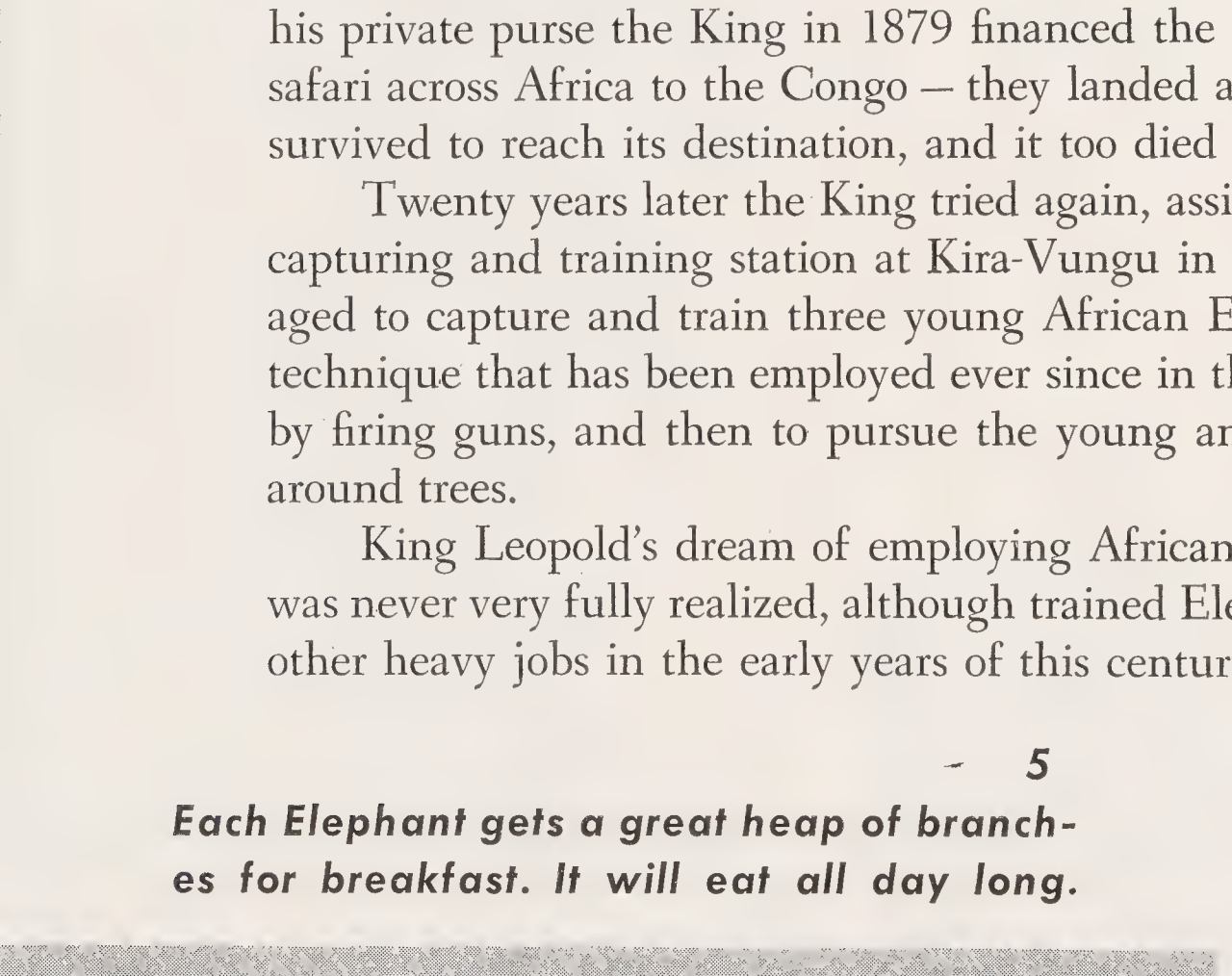
Transportation was an all-important problem in the Congo in those days but oxen, horses and donke were no answer to it, for they fell easy prey to the tse-tse fly. Elephants seemed to offer a solution and out his private purse the King in 1879 financed the importation of four Indian Elephants. The story of the safari across Africa to the Congo – they landed at Zanzibar – is a thrilling and a tragic one. Only one anim survived to reach its destination, and it too died a few months later.

Twenty years later the King tried again, assigning Commandant Laplume, a young officer, to establish capturing and training station at Kira-Vungu in the Lower Uele. By 1902 Commandant Laplume had ma aged to capture and train three young African Elephants and in subsequent years he worked out the captu technique that has been employed ever since in the Congo – to approach a wild herd of Elephants, scatter by firing guns, and then to pursue the young animals until ropes can be looped around them and snubbe around trees.

King Leopold's dream of employing African Elephants to do the heavy work involved in colonizatic was never very fully realized, although trained Elephants were supplied for lumbering and road-building ar other heavy jobs in the early years of this century and even today about 100 Elephants are at work on pla

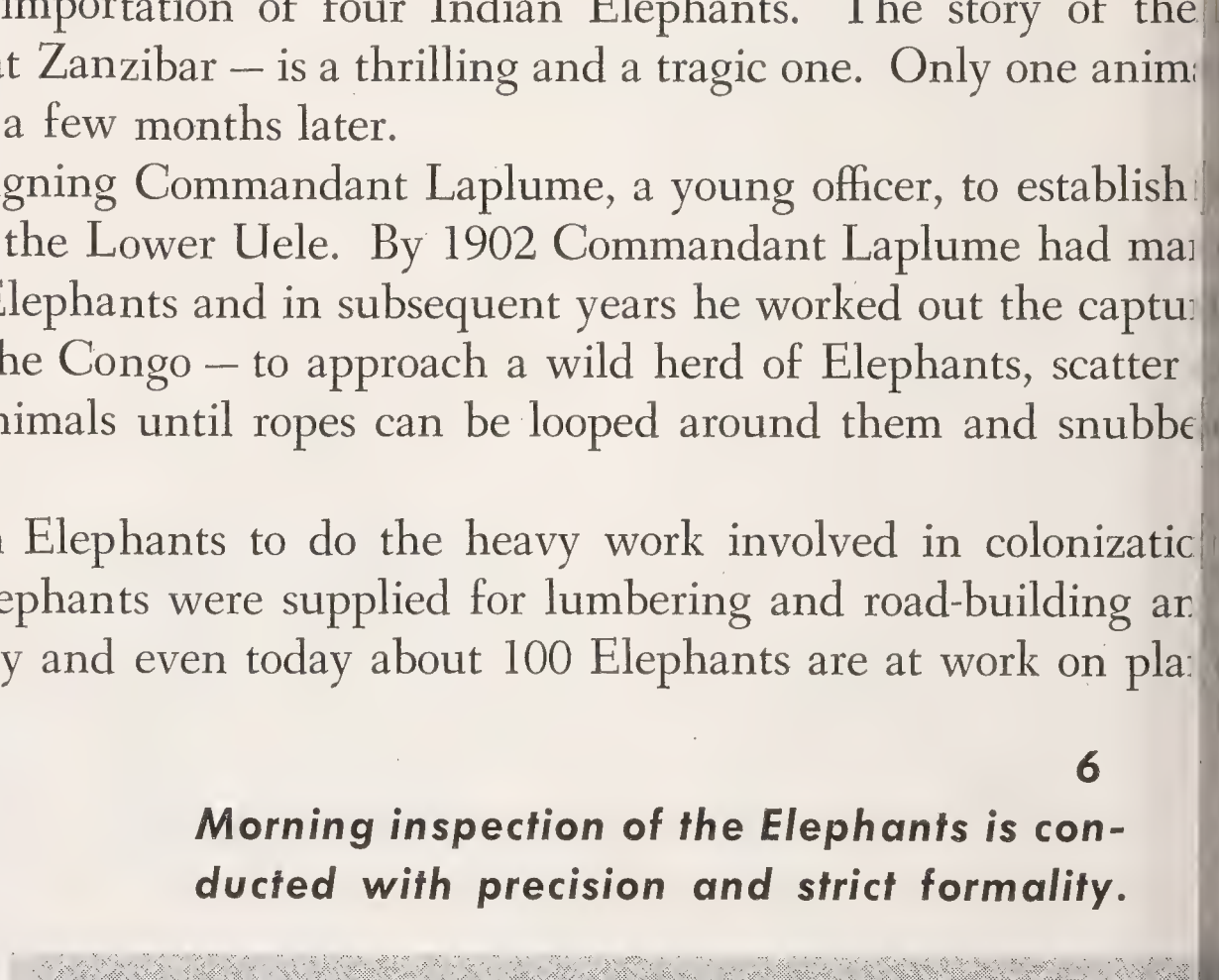
5

Each Elephant gets a great heap of branches for breakfast. It will eat all day long.



6

Morning inspection of the Elephants is conducted with precision and strict formality.





3

These three monitors are the special pets of the camp and the pride of the Aru herd.



4

One job of the monitors is to bring supplies of grass and branches into camp, for food.

tions in the Congo. Once roads had been opened and trucks and bulldozers were developed, the importance f the Elephant for heavy work declined.

Today the Elephant Domestication Station is kept up partly as a matter of pride – because it was a vorite project of the King – and partly to supply work animals and specimens for zoological gardens. From 927 until about two years ago the station was at Gangala-na-Bodio on the banks of the Dungu River. (See NIMAL KINGDOM, Jan.-Feb., 1948). Subsequently a new station was established at Aru, also on the Dungu, bout 18 miles away.

THE PHOTOGRAPHS in this series were taken at Aru and in the surrounding territory during the course of the annual Elephant hunt in January and February, 1948, at the beginning of the rainy season when the erds are more concentrated and the grass is too short to conceal them.

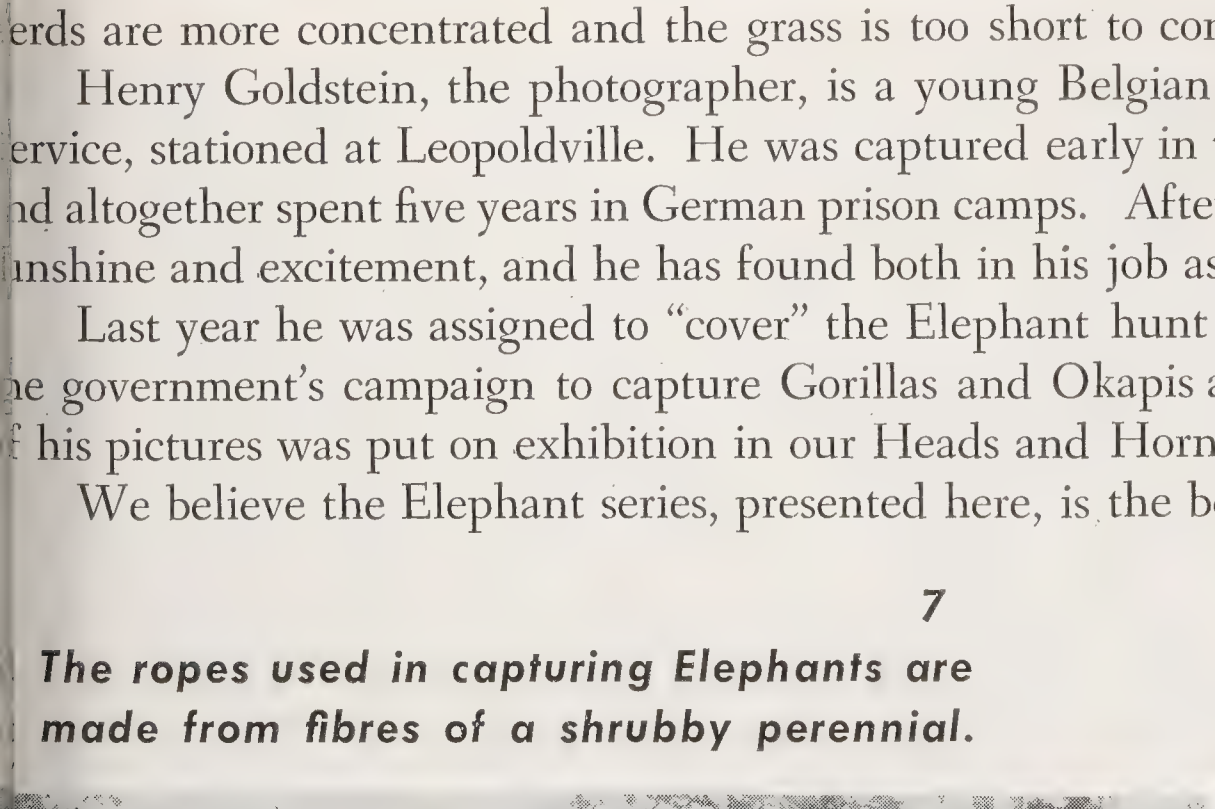
Henry Goldstein, the photographer, is a young Belgian on the staff of the Belgian Congo Information ervice, stationed at Leopoldville. He was captured early in the war, escaped and was re-captured three times, nd altogether spent five years in German prison camps. After the war he felt an understandable desire for unshine and excitement, and he has found both in his job as photographer in Belgium's great colony.

Last year he was assigned to "cover" the Elephant hunt at Aru, and then to report photographically on he government's campaign to capture Gorillas and Okapis at Bilota, on the Equator. A selection of about 80 f his pictures was put on exhibition in our Heads and Horns Museum Gallery on May 1.

We believe the Elephant series, presented here, is the best record of its kind ever made.

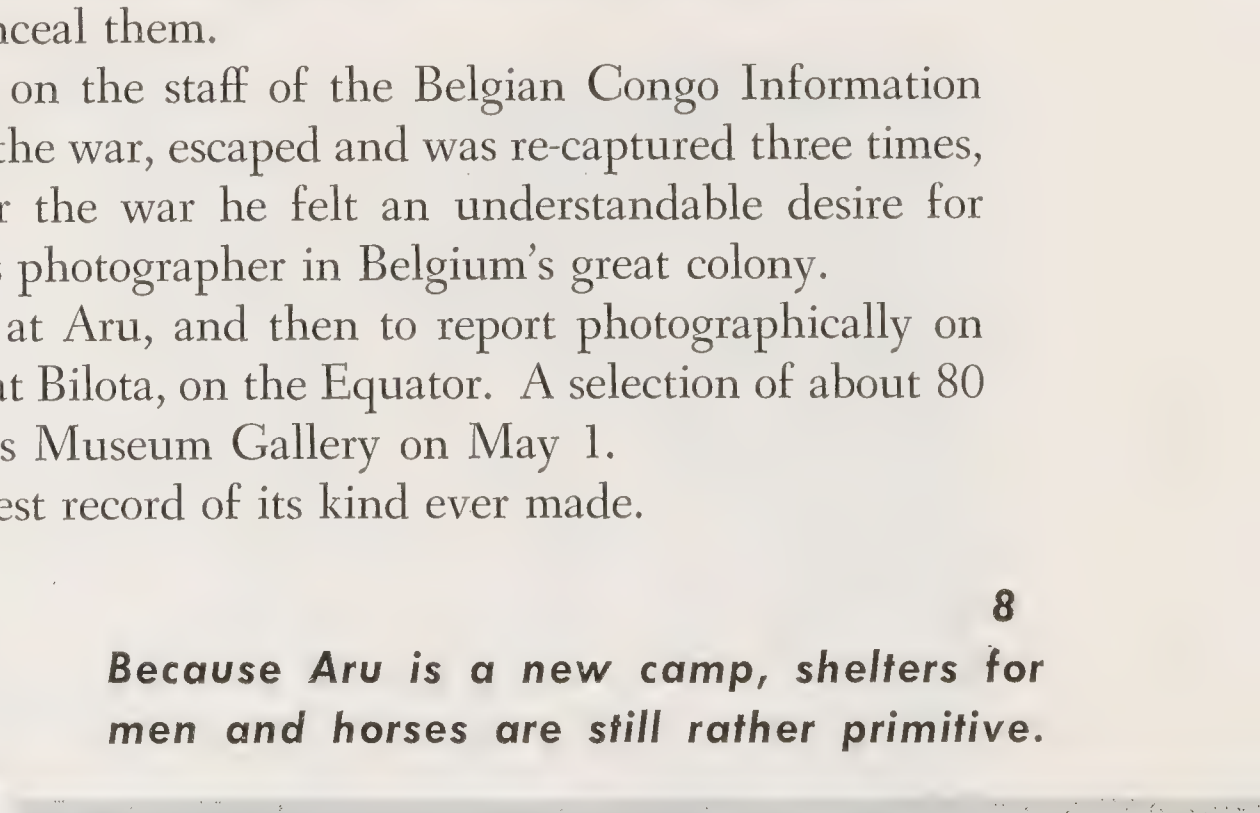
7

The ropes used in capturing Elephants are made from fibres of a shrubby perennial.



8

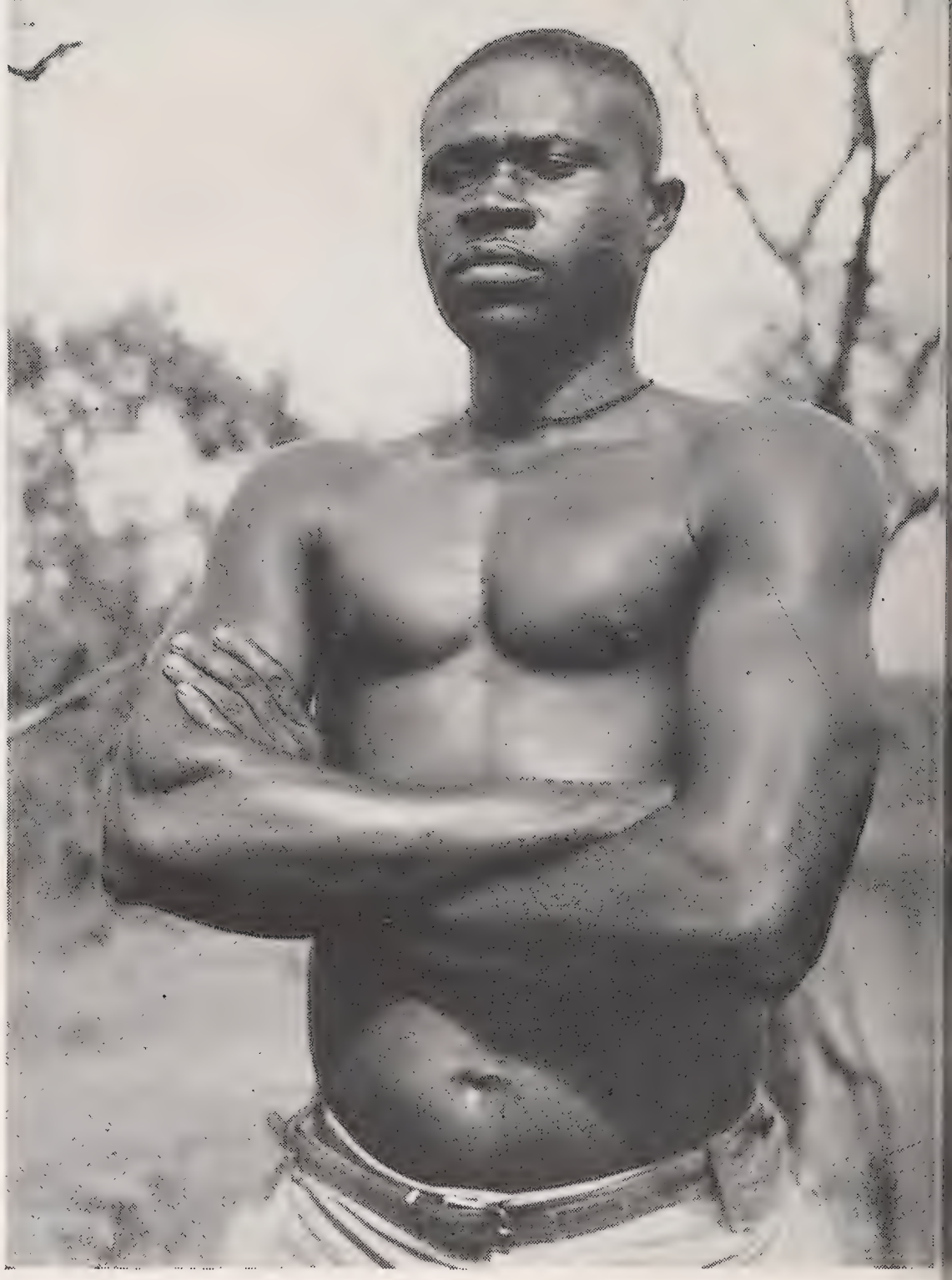
Because Aru is a new camp, shelters for men and horses are still rather primitive.





9

The hunting party starts its search for Elephants.



10

Typical of the hunters is this Zande tribesman.

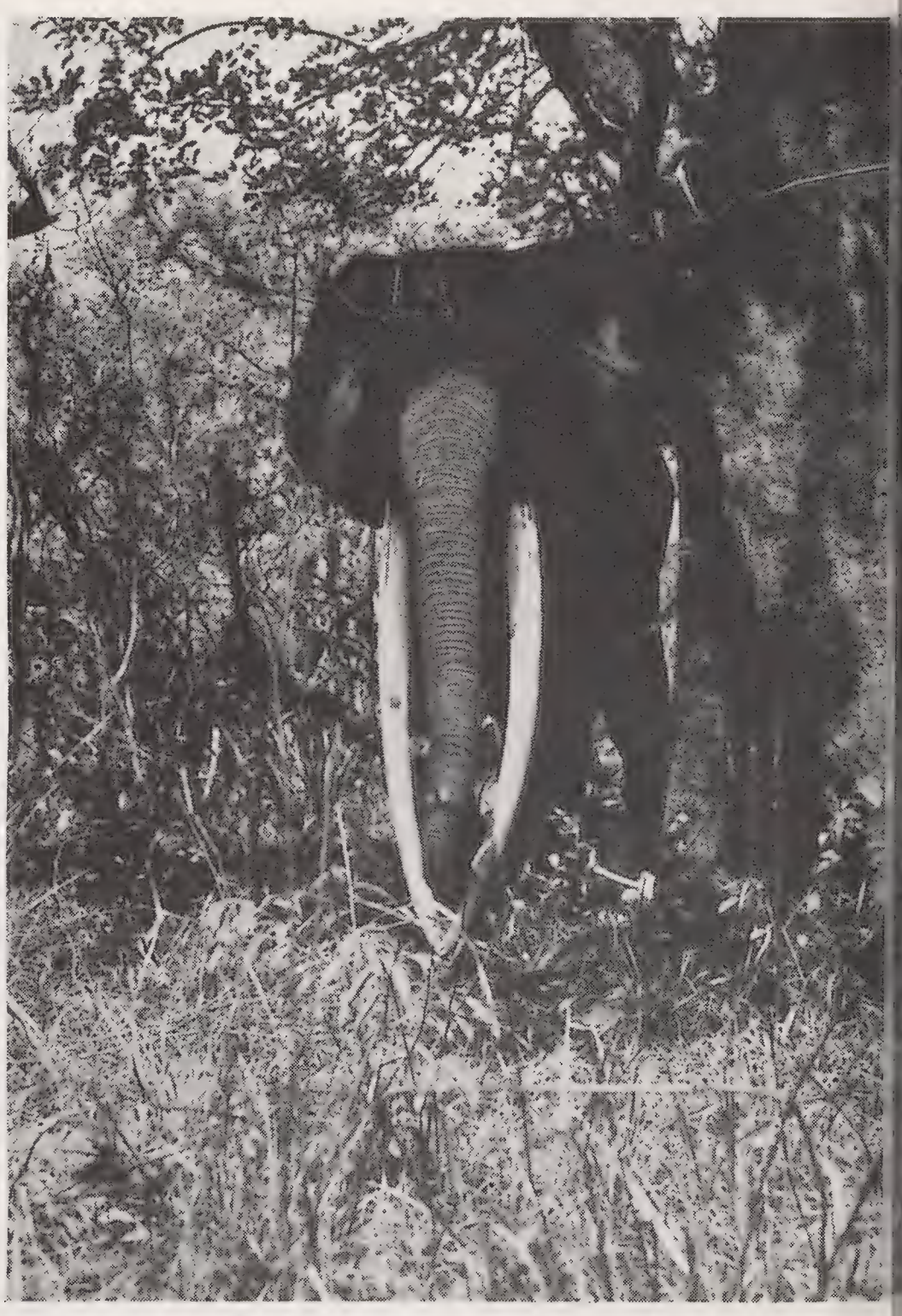
11

Monitor Elephants accompany the teams of hunters, ready to go to work when needed.

12

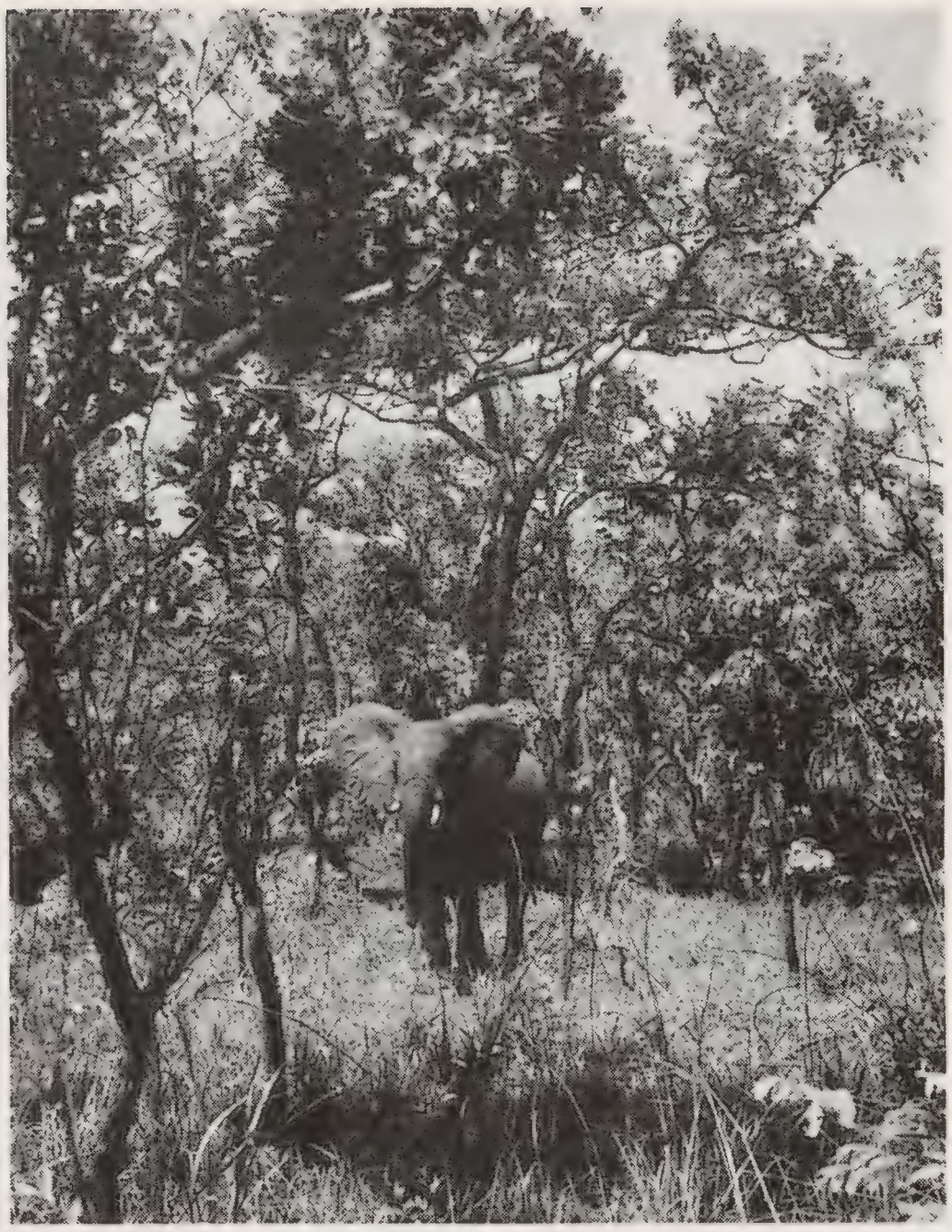
A big male Elephant—one of the monitors —rests in the shade during a noonday halt.







13
The hunters are in good Elephant country — scrubby bush.



14
An Elephant is surprised — but too big to capture.



15
The hunters halt to view a herd in the distance.

16
Here is what they saw—a herd feeding peacefully.



17

The herd has stampeded and hunters race after the younger Elephants.





18

Shallow rivers stop neither Elephants nor men.



19

Spills in rough country are routine occurrences.



20

The first Elephant is captured—ropes around trunk and one leg are snubbed around a tree.

21
Now a monitor approaches the newly-caught Elephant.

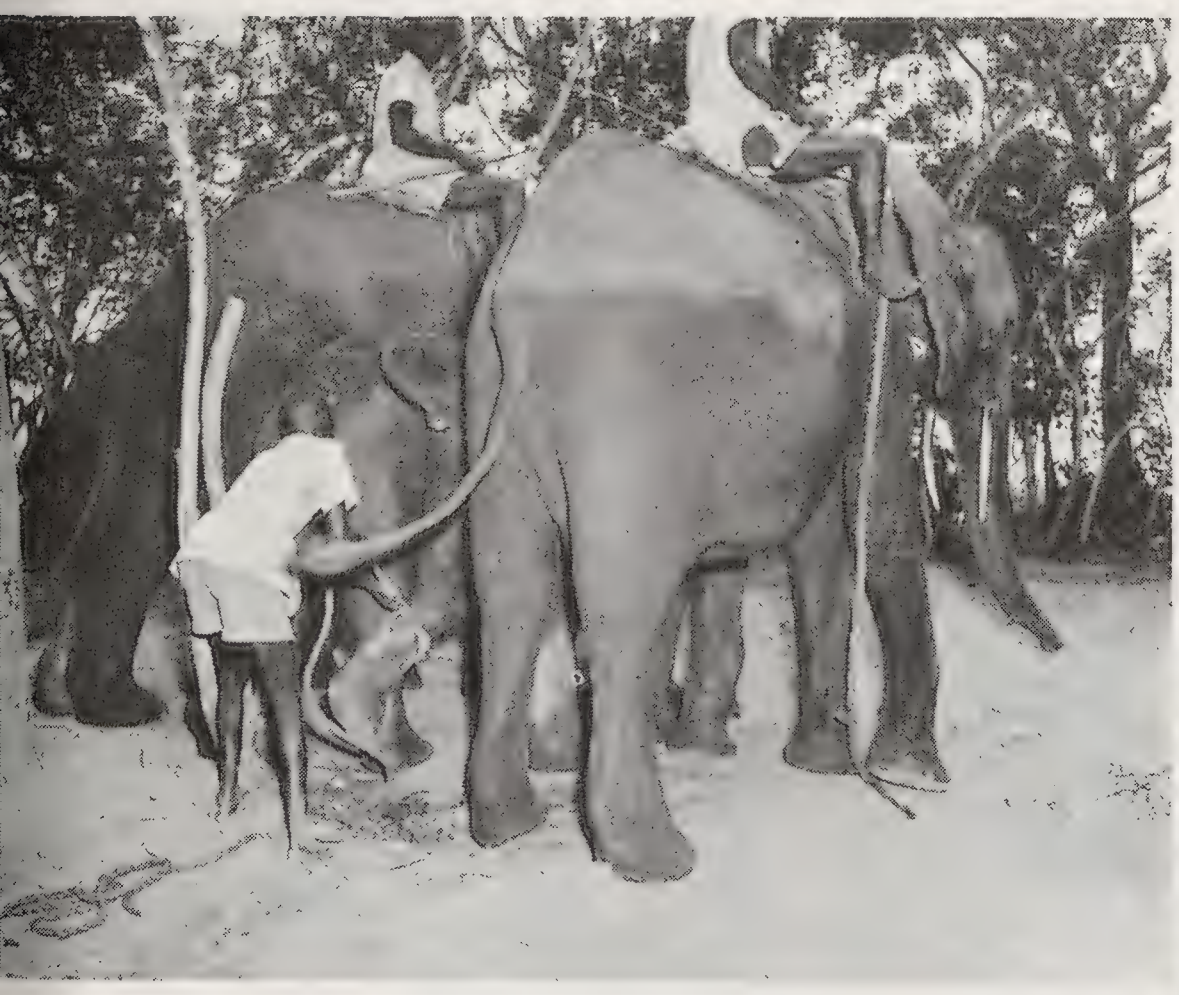




22 *A baby Elephant is tied between two steady, calming old monitors.*

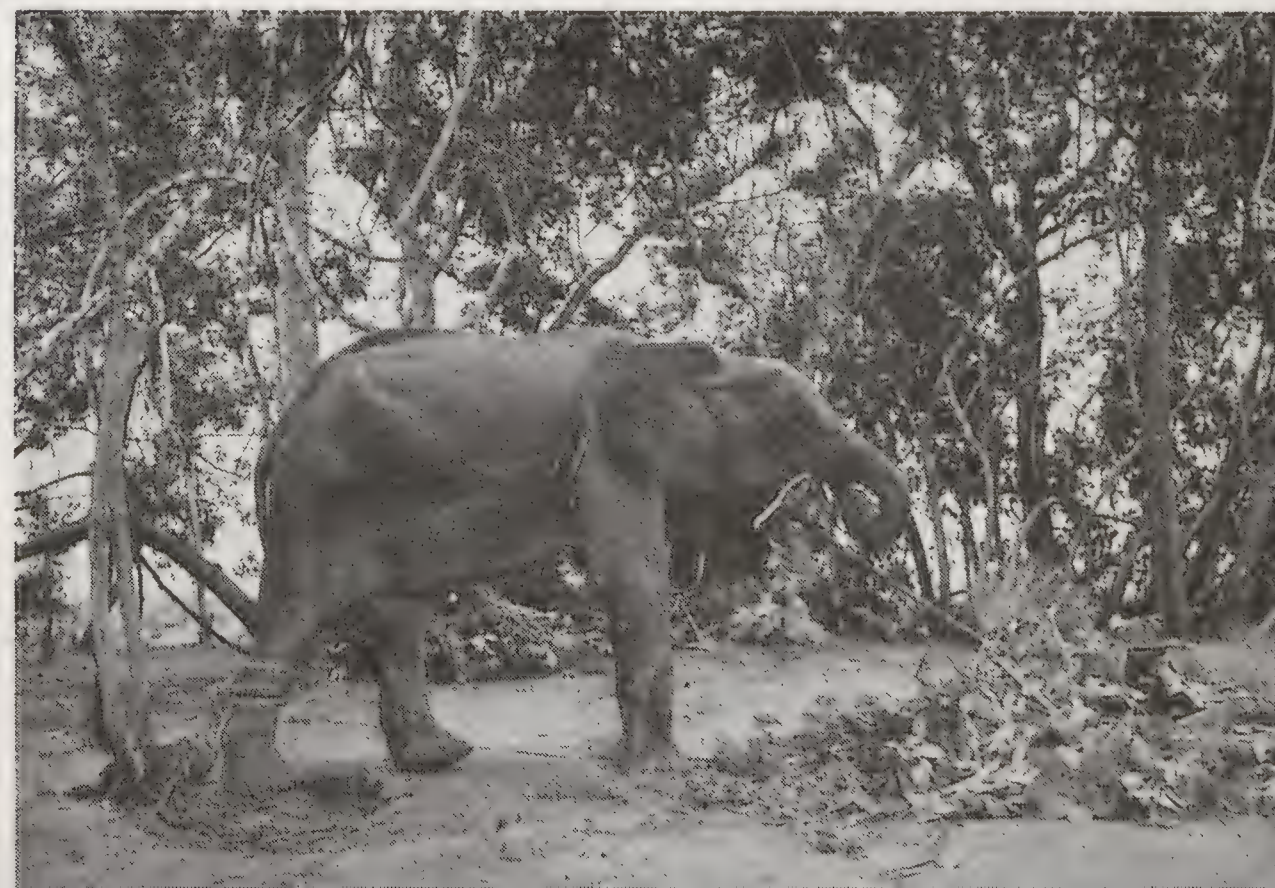
Monitors conduct a party of captures back to camp. 23





24 *At the camp, a youngster is untied from the monitors that led it in.*

Captivity isn't so bad — there is a great pile of food always at hand. 25



LESS THAN TEN YEARS AGO there was precious little that could be done about some insect pests except share the crops with them. They could not be controlled, not satisfactorily, with the common run of toxic materials then available to combat them. They were too tough. It remained for the development of a whole new class of insecticides, with DDT in the vanguard, to change the public attitude from one of secret despair to one of exuberant hope.

But this hope should be tempered with restraint, for these new synthetics are powerful, death-dealing substances. When improperly used they are capable of setting up chain reactions detrimental to wildlife, to crops, to domestic animals and the health of man.

Federal, state and private agencies concerned with this vital problem have been attempting to establish boundaries within which it is safe to operate. Although many of their findings are as yet inconclusive or even contradictory, owing to the complexity of the case, nevertheless enough has been forthcoming to indicate roughly where the lines should be drawn.

For the most part it is conceded that DDT in oil, dispensed by airplane over forested areas at 1 lb. per acre, does not affect bird or mammal life; yet it gives substantial control of many pest insects. On the other hand, if the rate of application is increased to 4 lbs. per acre, death of nesting birds and some mammals is certain. Even 2 lbs. per acre is dangerous.

The extent of the danger is influenced by more than mere dosage. The kind of animal, age of animal, time of application and size of treated area — all enter into the picture. Cold-blooded animals such as fish and frogs react to DDT poisoning far quicker than birds or small mammals. Calves are more readily affected than cows because of their smaller size and delicate nature.

During the nesting season birds establish territorial rights which are closely held and seldom violated. Death to a major part of the insect population within a "claim" is a serious matter, for most young birds require insects in continual supply. When insects are lacking, starvation inevitably results.

Apparently nesting birds can swallow a limited number of DDT-weakened insects without injury, provided such insects do not comprise a major part of their diet. Once insects are dead and have fallen to the ground, however, birds accustomed to picking them off foliage or tree trunks give them scant notice.

In Montana the use of Chlorinated Camphene at 1½ lbs. per acre for grasshopper control did not noticeably affect the birds because it was applied *after* the nesting season. Territorial rights had largely broken down and birds permitted random poaching by others of their species. At least part of the insects consumed came from untreated areas.

This fact would suggest that spraying or baiting during the nesting season should be avoided wherever possible. It would also suggest that applications of toxic materials over large areas is unnecessarily disturbing to bird life, driving it far afield to get sustenance in regions perhaps already over-crowded. Presumably the disturbance would be less violent if the poison were applied in broad rows, leaving alternate rows untreated, after the manner of strip planting in agriculture.

The Montana grasshopper bait did not kill any deer, antelope or reptiles but it did kill amphibians.

It is well-known that DDT is practically insoluble in water. When used as a suspension spray it is less toxic to fish than when used in solution or emulsion. DDT is more deadly at

Insecticides With Long Arms

By BRAYTON EDDY



26

Taming has started — an attendant begins making friends by offering favorite food.



27

Some of the small fry are given liberty in an enclosure, tended by the monitors.

28 *And then there comes a time when the new Elephants are quite accustomed to domestic life, and i company with the herd of monitors they make daily trips to the Dungu River for a refreshing bat*





U.S.D.A. Photo

Dusting of cottonfields with insecticides for the control of the boll weevil is standard practice in some areas and a low-flying airplane scatters the insecticide effectively and at low cost.

high temperatures than low temperatures, in clear streams than in muddy streams or streams with muddy bottoms.

The use of DDT suspension at 1/10th lb. per acre, recommended for control of malaria mosquito wrigglers, appears safe for desirable aquatic organisms; but at the higher concentrations required for pest mosquito wriggler control it borders on being dangerous. Wrigglers killed by DDT are *not* noticeably poisonous to fish.

Several low-temperature streams sprayed by air in sections from one to three miles long, using DDT at 1 lb. per acre, showed no appreciable damage to game fish or turtles, but a kill of 70% to 90% of fish food organisms was noted at the lower sampling stations. Apparently there was some accumulation of toxic particles downstream, else this high invertebrate mortality would not have occurred. The condition was found to be temporary, however, for within a year the number of bottom-feeding insects was reported as great as before the treatment although the composition of the population had changed. Untreated sections of the streams had served as reservoirs for re-population of the treated sections.

Where spray material is unevenly distributed or re-spraying is unintentionally done, heavy losses may result.

DDT has been found more toxic to fish than Benzene Hexachloride but less toxic than Chlorinated Camphene. Its use over shallow lakes, streams or tidal zones is strictly to be discouraged because of the loss it causes among certain top-feeding fish, frogs, crayfish and edible crabs. Aerial application should never be made at concentrations of more than 1/5th lb. DDT per acre, or more than 1/10th lb. per acre if the treatment is scheduled to be repeated several times during the season.

Many persons are rightly concerned because some of the new toxicants used against pest insects cause high mortality of beneficial parasites and predators. This fact is most evident when DDT is applied to pear and apple orchards for the control of Codling Moths. It gives excellent

control of the caterpillars, but by destroying parasites which normally have a restraining influence upon spider mites, aphids and scales, these lesser organisms themselves become major problems.

It has been observed that parasites in flight within a forest area during time of treatment with DDT are nearly all killed. Nevertheless, the total population is not greatly disturbed, except for a short period, because parasites in dormant stages are little if any affected. DDT is *not* an ovicide.

High concentrations of DDT for experimental purposes, using 25 lbs. per acre, are injurious to most plants, causing chlorosis, necrosis, stunting and deformity. It affects to a diminishing degree squash, cucumbers, beans, tomatoes, onions and strawberries. It causes delayed germination of bean, corn and cucumber seeds; yet in some cases it actually stimulates plant growth. Where growth is over-stimulated, death may occur just as when a plant is treated with a herbicide hormone such as 2-4-D.

The synthetic sprays under discussion, when applied to foliage in normal amounts, cause little if any damage, but the residue on fruits and vegetables is extremely difficult to measure. For these reasons, and because the U. S. Food and Drug Administration strictly regulates the amount of residue tolerated on food products offered for sale, it is inadvisable to spray edible fruits, grains or vegetables within 3 or 4 weeks of harvest. Benzene Hexachloride furthermore imparts to them an unpleasant flavor.

Plants grown in DDT-treated soils respond in various ways according to the nature of the soil, the variety of the plant and the age of the plant. Oats are tolerant of DDT whereas rye is adversely affected. Damping-off organisms destructive to young plants are encouraged by its presence. Ornamentals are not apt to suffer because they are deep-rooted.

Chlordan, Benzene Hexachloride and DDT are stable in the soil, DDT remaining toxic sometimes for over four years. This fact it is well to remember when planning to make several applications of the material to a given area. The run-off from sprayed plants is more or less cumulative, rendering the soil increasingly harmful to some plant species. DDT in muck soil, however, has been found to cause no root injury whereas the addition of lime may produce it. Because Chlorinated Camphene tends to break down in the soil, its effect is less likely to be of long duration.

During the early development of DDT, persons learning of its wide-spread killing powers were afraid of the effect it might have upon pollinators. Orchardists knew that a wholesale slaughter of honeybees would result in a poor set of fruit and apiarists were alarmed for their industry. But neither DDT nor Chlorinated Camphene have fumigant effects. When used at prescribed rates, no chain reaction is set up to cause death of hive bees or their larvae. On the other hand, fluorides and arsenicals, which have been used freely in the West for pest insect control, not only kill field bees but through contamination of pollen kill the entire colony.

In California concern is felt for wild bees because they are the chief pollinators of alfalfa. Since the queen goes into the field along with her subjects, and they are dependent upon her for stability, her death would mean the demise of an entire colony of 50 or more individuals. Chlordan is harmful to all types of bees, but only if they are hit by it. If applied early in the morning, before the bees are flying, few casualties are incurred.

Relatively little work has been done in determining the effect of synthetics upon domestic animals. In Texas, however, it was found that Chlordan, Benzene Hexachloride, and Chlorinated Camphene can be damaging to calves when used as a spray at twice the strength recommended for tick control. Only Chlordan at this strength will kill young steers, sheep, goats and hogs. Dips are more deadly than sprays. Under normal field conditions, however, when used at a reasonable rate, none of these poisons were fatal to adult farm animals. Nevertheless, DDT sprays are not recommended for use on dairy animals because of the fact that small amounts of it may subsequently be recoverable in the milk.

There has been some concern about cows being fed contaminated fodder. DDT dust has been recovered from green corn stalks at a rate which might in time prove hazardous to cows and calves, since it is detectable in milk and dressed beef. But after a period of 4 months,

livestock fed DDT-dusted hay and unshucked corn showed no external symptoms of poisoning.

Parathion is sometimes taken up by corn plants in sufficient quantities to be toxic to corn borers, but its effect upon cattle eating it has not been determined. Two applications of Chlorinated Camphene at 1 lb. per acre is recoverable in milk, but seems to have no immediate effect upon calves drinking it.

It is apparent from what has been remarked about spray residues on fruits and vegetables, and trace elements present in milk and beef, that synthetic insecticides could become a menace to man rather than a blessing. To inhale the dusts or allow DDT in oil solution or Parathion to come in contact with the skin is not advisable. The residual effect of one application of DDT indoors, even after a period of six months, has been enough to kill house flies.

Fortunately both State and Federal authorities have been alert to the dangers of DDT and other synthetics from the very beginning of their manufacture and have consistently discouraged their unwise use.

At a time when insect pests have built up a resistance to standard insecticides, it is comforting to know that new ones are being produced with longer arms.[1]

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[1] This article is based upon information published in recent entomological journals or government pamphlets, or disclosed at the joint meeting of American Entomological Societies held in New York last December.

News from the Conservation Foundation

President Osborn Addresses U. S. Chamber of Commerce

President Fairfield Osborn addressed the 37th Annual Meeting of the Chamber of Commerce of the United States held in Washington, D. C., on May 2-5. Taking part in a four-man discussion on the subject of "Our Renewable Resources", Mr. Osborn's topic was "Modern Economy's Threat to Our Resources."

Others speaking on the same program were Charles E. Kellogg, Chief, Division of Soil Survey, U. S. Department of Agriculture, who spoke on "Prospects of Soil Science;" Louis Bromfield, of Malabar Farm fame whose topic was "A Farmer Faces the Problem;" and J. Philip Weyerhaeuser, Jr., President, Weyerhaeuser Timber Company, who talked to the theme of "Answering the Threat of Forest Depletion."

In the Chamber's circular announcing the program of the conference, the following significant paragraph occurs:

> No businessman with hopes for the future of his business can long ignore the increasing pressures upon our soils, our water, and our forests. The Chamber has recognized this and has invited discussion by four authorities of nation-wide recognition. Their considered opinions based on long study of the facts will be presented in the Round-Table discussion, "Our Renewable Resources Can Be Sustained." Your own questions can help guide the discussion that will follow.

The Foundation staff finds great satisfaction in the fact that top industrial leadership is evincing such interest in these problems.

More Manpower Is Needed for Land Improvement

Increased interest on the part of thousands of farmers throughout the United States in developing a complete farm conservation plan and applying modern conservation practices is swamping the Soil Conservation Service. There are approximately 8,500 technicians employed by the Soil Conservation Service but many farmers who have applied for technical advice have been waiting for a year or more for their services. Conservationists are pleased at this evidence of increased interest in conservation practice but there remain

many more thousands of farmers who are not yet informed of the benefits to them and to the nation which will flow from better land usage. Members of the staff of the Conservation Foundation estimate that it would take 12,000 additional technicians twenty years to service all the farms in the United States.

Although only one percent of the national budget is appropriated for conservation activities today and conservationists believe that a much greater expenditure of federal funds is justifiable in view of the increased income tax payments which would follow greater production from good conservation practice, there is a very real question as to the way in which conservation work should be financed. Since technical service benefits the farmer in the forms of increased income and increased capital value, should not the cost of such advice be borne, at least in part, by the owner?

Various plans have been suggested, including the formation of a quasi-public corporation authorized to sell bonds to the public and to lend the proceeds to farmers to enable them to employ land use technicians, such loans to be repaid out of increased earnings.

This whole subject constitutes a problem which all citizens who are interested in conservation should consider.

Michigan Garden Club Praises Foundation Films

Great pleasure was felt at the Conservation Foundation on receipt of a letter from Mrs. LeRoy Clark, Chairman of the Conservation Committee of the Garden Club of America. Mrs. Clark sent a verbatim quotation from the Annual Report of the Garden Club's Michigan representative.

For the benefit of Society members who may wish to show our films to garden clubs and other organizations, we quote from the report as given to us:

"When the release of the Conservation Foundation's 'The Living Earth Series' was reported last fall, the Garden Club of Michigan's Conservation Committee laid plans to have the honor of introducing it to the state. The way was made delightfully easy when Mr. Ford L. Lemler, Director of the University of Michigan's Audio-Visual Education Center, promptly purchased a set for the Center's collection from the Encyclopedia Britannica, Inc.

"The first gathering of Garden Clubbers that offered an opportunity for the effective showing of the series was the District No. 2 fall meeting of the Federated Garden Clubs of Michigan. Those in charge of this meeting accepted our offer to demonstrate to the Program Chairmen of the district the range and possibilities of the films suitable for garden club meetings that could be rented from the University's Center.

"Mr. Lemler opened the meeting with a short talk on the practical aspects of film display. He pointed out that High Schools, Consolidated Schools, often Churches have the equipment and auditoriums for showing films. He advised that a film showing was much enhanced by having a moderator or chairman who was a specialist in the subject shown (a botanist for plant material, an ornithologist for birds, etc.) who would speak after the showing, answer questions and lead the discussion.

"We then showed parts of five films on flower subjects, reserving the major portion of the time for 'The Living Earth Series.' The response was most gratifying. There was manifested a marked enthusiasm for this masterly presentation of the complex problem of the accelerated drain on fundamental resources and the conservation measures that are in operation to check these inroads on our security. Right after the lights were turned on and before the equipment could be packed up, the series had been booked for showing the very next night at a Garden Club meeting in Tecumseh.

"For those who seem to carry ancestral memories and to whom come, even if dimly, the hints the land reveals, these four films are a moving adventure. As you sit in the darkened auditorium and you see the brutal and unheeding treatment accorded to this 'mother of us all,' something deep in one's nature is stirred. The glimmer of a new revelation of what this gift was intended to be and a glimpse of how it was to be used and shared, flickers in the mind. A longing to have mankind attend, presses home.

"A high point in the series to many is the view

(*Continued on Page 96*)

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

New Home-in-the-Jungle for Tropical Research

After many years of searching, the Zoological Society's Department of Tropical Research has found and acquired a permanent tropical jungle home. This is a spacious building, appropriately named "Simla;" together with 22 acres of woodland it is situated at 800 feet above the sea in a forest preserve in the heart of the northern mountains of the British island of Trinidad. The island of Tobago and the coast of Venezuela are within sight of Simla.

A fuller announcement of the Department's plans for the station will be made later in the year.

Arowana at the Aquarium — First in Ten Years

The Aquarium now has on exhibition an Arowana, *Osteoglossum bicirrhosum,* from the Solimoes River several hundred miles west of Manaos, Brazil. This is a species of fish rarely taken, especially when small enough to withstand transportation, and our example is the first we have seen in more than ten years. It is as remarkable in appearance as it is rare, with a peculiar elongate shape and a mouth that looks like nothing so much as the ramp on a combat landing craft. Two prominent forked barbels that project straight forward from the front edge of its lower jaw make it look even more bizarre.

The function of these flexible, but not voluntarily movable structures is somewhat of a mystery. The fish characteristically swims high in the water with its barbels resting at or near the water surface. It is a surface-feeder and seems to employ these as exploratory organs. Nevertheless, we have seen a specimen that had lost its barbels through some mishap and it was apparently not at all discommoded by their absence.



The Rare Arowana

The Arowana is reputed to be a mouthbreeder, that is, to carry its eggs in its mouth. Our two-inch specimen was one of a school of about 400 babies that was accompanied by a large fish, about 3 feet long and presumably the mother, at the time of its capture. The collectors report that these fish defend their young with great vigilance, even to the extent of attacking a dugout and upsetting it.

The specimen now in the Aquarium presented a feeding problem when it first arrived. None of the routine foods tempted it, and even such delicacies as Daphnia and Drosophila evoked only desultory interest. Live cockroaches and houseflies finally proved to be the solution. The Arowana is now feeding well, and growing rapidly.

Osteoglossum can be considered a living fossil, since its Family dates back some 50 million years. Fossil osteoglossids have been found in Europe and in Wyoming in this country, but today there are only four geographically isolated species still alive – remnants of a once widespread group of fishes. Two of them are found in southeastern

Asia and northern Australia, one in Africa and the Arowana in most of the fresh waters of northern South America. — C.W.C. & J.W.A.

Four Kinds of Penguins Are in the "Cooler"

The success of our Penguin "cooler" in carrying our King Penguins through last summer's heat, has given us hope for new vistas. Besides the King, there are many handsome and interesting penguins that have not been available to us because of their inability to withstand high temperatures.

Following up our presumed advantage, our two Kings are now sharing their "cooler" with two Gentoos, two Rock-hoppers and a Golden-crested. With temperatures ranging from 52 to 56 degrees, these recently imported birds will have opportunity to adapt themselves without the handicap of the overpowering summer heat which antarctic and sub-antarctic penguins cannot withstand. If the experiment proves successful, we may look forward with pleasant anticipation to the erection of our permanent penguin exhibit.

Our flock of Black-foots from South Africa and Humboldts from southern South America, is now so well acclimatized that the birds are able to live out of doors the year around. Also, young have been reared annually for several years past. — L.S.C.

The "Fox" from Costa Rica Was a Yapock

Early last winter General Curator Crandall received an inquiry from Costa Rica: Would we care to have a Yapock?

We would, certainly. The Yapock is the Central American Water Opossum, a rare animal, only one specimen of which had ever been exhibited alive outside its native country. That was the specimen our collector Charles Cordier brought back from Costa Rica in 1947. It lived 101 days in our Small Mammal House.

Another Yapock would be very nice, but winter was a bad time to ship a delicate tropical animal by air, and Mr. Crandall wrote to the inquirer, Sr. Alfredo Scott, saying that we would be delighted to have a Yapock this spring.

Then he forgot all about the matter, for casual offers of rare animals seldom get beyond the offer stage.

But on May 4 an air express truck delivered a small box to the Zoological Park. The papers accompanying it said that it contained a "fox." The screen wire top of the box revealed a mass of shredded newspaper and a few inches of bare tail. It was obviously not a fox, but Mr. Crandall figured it was one of the common tropical opossums hardy enough to stand a two days' trip by air without food or water.



Our New Yapock

He removed the screen wire, stirred the shredded paper, and there was a Yapock. A young one, about two-thirds grown.

The box had been delivered to the Aquarium along with a routine shipment of crayfish and chameleons, and Mr. Coates and Mr. Malcolm of the Aquarium staff turned out to rig up a temporary home for the newcomer. They prepared a disused Electric Eel tank as a "Yapockary," with six inches of tepid water, a ramp of stones, and a board where the animal could dry itself. They opened a fresh box of crayfish and placed a temptingly big one on the board.

The Yapock emerged from its box, sniffed the water, sniffed the crayfish, and turned away. But not far enough; the crayfish was lively and it closed a claw on the Yapock's nose. That brought instant action, and in a flash the Yapock seized the crayfish in its mouth and devoured it.

During the night it ate two more crayfish, swam and disported itself in the water, and is apparently in excellent condition despite the rigors of its air trip.

The animal presents exhibition difficulties, since it is normally nocturnal and sleeps all day. Until that problem is figured out, the Yapock will be kept in seclusion in the Animal Nursery.



This long-legged fawn posing so unconcernedly with its mother is the first Pere David's Deer to be born in the New World. It arrived on April 10, thus beginning to fulfill the hopes we entertained when four of these rare deer came to us in late 1946 from the Duke of Bedford, via Whipsnade. We wanted to found a herd which would give a vanishing species a new impetus for survival. Now we look forward to the possibility of two more fawns in the spring of 1950.



This spring the Pere David's Deer stags developed magnificent antlers, fully representative of the curious heads for which the species is noted. This stag will be out of velvet in early June. The normal rutting season in the Bedford herd is July and August; here it began in mid-June last year. The stags should be full of fight as soon as they lose their velvet, and will have to be separated. We expect that the antlers will be dropped in January, as they were this year.

Staff Men at Hospitals

Members of the Society's staff have been entertaining patients in various naval and military hospitals during recent months by taking part in a natural history quiz program, sponsored by the American Theatre Wing Hospital Committee and the Red Cross. As a "panel of experts," led and spirited by Herman Forster, Deputy Commissioner of Water Supply, Gas & Electricity, they have been answering hundreds of questions and exhibiting a few snakes and small mammals to enthusiastic audiences of service men and merchant seamen.

Curator Eddy handles the questions on reptiles, amphibians and insects and has more questions fired at him than anyone else. Questions on mammals and general topics are taken by Mr. Knobloch of the Education Department, and those on fishes by Assistant Curator Atz. The Park's artist, Lloyd Sandford, is a student of birds and often illustrates his answers, as those of his colleagues, by sketching on the spot. John Kieran, of the original "Information Please" fame, has been a guest star with the panel on several occasions.

A Pair of Young Condors Comes to the Zoo

For some reason, the great Condor of the Andes has always been difficult for American Zoos to obtain. Unloved in the southern sections of its range, where it is said to descend from the heights to harass the valued guano-producing birds of the off-shore islands, it still is not frequently taken into captivity.

Since the end of World War II, we have made every possible effort to secure a replacement for our last fine specimen. Promises were made but remained unkept until April 4, 1949, when a subadult pair was secured through the efforts of a Society member, Roland Lindemann.

The South American Condor is the world's largest land bird of flight, on the basis of wing spread, which has been reported as reaching fourteen feet from tip to tip. This is exceeded only by the Wandering Albatross, reputed to achieve a maximum spread of seventeen feet. — L.S.C.

Dacca Produces Three More Healthy Tiger Cubs

"In any well organized collection, young animals are expected to be born and their appearance becomes more or less a matter of routine."

This quotation is the opening sentence of an article in ANIMAL KINGDOM for March-April, 1944, called "Three Tiger Cubs." It was a lead-in to the point that while some births are ordinary enough, young tigers are rarities indeed. In 1944, the point was definitely good, for no tiger had ever been reared in our Zoological Park. Even now it probably would be premature to say that



Mrs. Martini and "Sandy" Inspect the Newcomers

tiger breeding has become routine. It never could be that. But we can go so far as to say that May is a nice month for tiger cubs and that enough routine has been developed for Dacca to take advantage of that balmy month two years in succession. The 1948 cubs came on May 4th and this year they were two days later — actually the night of May 5-6.

There are three cubs this time and the division of sexes is much to our liking: one male and two females. After forty-eight hours with the mother, one of the females was turned over to Mrs. Martini for rearing. Not because lovely Dacca isn't a perfect mother but as a test for our feeling that bottle-fed tiger cubs have other advantages than mere tameness over those reared by their mothers. — L.S.C.

This Is the Third Season for Our Duck-billed Platypuses

When Cecil and Penelope, our two Duck-billed Platypuses, were returned to their out-door "Platypusary" on May 6, they began their third summer of exhibition in the Zoological Park. Platypuses, like tiger cubs, have by no means become routine but as longevity records mount, day by day, our confidence increases proportionately.

Received on April 25, 1947, these two exacting little creatures have now passed the two-year mark. They seem to us to be in even better condition this year than last.

The struggle to maintain them has become less hectic, if not less extensive. Their keeper, John Blair, devotes himself unceasingly to their welfare. The Aquarium staff has developed its "Worm Farm" to the point where the production of two pounds of squirming provender daily really is routine. Unfailing sources of crayfish, frogs and mealworms have been established. We have learned that November 1 approximates the date at which the Platypuses must be removed to the warmth of the Bird House basement and that somewhere around May 1 it will be safe to return them to summer quarters.

Our records show that 267,268 visitors passed through the turnstiles of the Platypusary in 1947 and 1948. At this moment there is good reason for the hope that very many more will have an opportunity to view these greatest rarities of the zoological world. — L.S.C.

The Cuban Solenodon—Unprepossessing But a Zoological Rarity

There are mammals noted for beauty but the Solenodon is not one of these. Unlike the Warthog which displays its unlovely features with frank indifference, the Solenodon relies on neutrality. In color, it varies from mousey brown to mousey yellow. Its body is soft and dumpy, entirely lacking in grace. It has a long, rat-like tail, a long, mobile nose and tiny eyes. It is barely larger than a well-grown brown rat. Nocturnal in habit, it spends the daylight hours deep in restful sleep, so that its exhibition value is next to nothing.

Yet this unprepossessing creature is among the



A Fine, Fat Haitian Solenodon

most sought of zoological rarities. For it is a representative of the primitive order Insectivora, the lowest of the placental mammals.

The Cuban Solenodon, a specimen of which was exhibited in the Zoological Park in 1910, is now believed to be extinct. The Haitian Solenodon still survives in small numbers and two living specimens arrived here on March 10, 1949. One of these succumbed almost immediately to a bacterial infection but the other remains as fat and sleek as a Solenodon can be, in the care of Mrs. Martini. — L.S.C.

Australia's Sugar Glider

(*Continued from Page 76*)

trees — favorite Sugar Glider homes — become the starting points of nocturnal playtime. From odd small cracks the gliders come out one by one. Scurrying up the trunk and along the boughs with occasional halts for a languid stretching of membrane-fringed limbs, they eventually arrive at the extremity of some gaunt dead branch. Each appears to meditate for a space, nosing the air in all directions, while the sensitive little ears twitch backwards and forwards. Then suddenly one will poise with nose out and tail stiffly in line. Impulsively it leaps forth, gliding swiftly and gracefully down and away into the darkness, while another glider takes its place at the end of the "springboard." Thus, one by one, they jump forth to glide away among the trees, rising upward and gently landing on their accustomed trunks after masterly aerial judgment. And so the rambles of the mysterious night time continue until the coming of the dawn.

The Living Earth Films

(*Continued from Page 89*)

of an experiment. A cubic yard of virgin humus-filled woods soil, the kind you used to dig up when as a wicked child the spring fever sent you into the woods to gather wild flowers. This soil is fronted by a piece of glass. A like view beside it is of soil – the subsoil which remains after the top soil has been washed away to the sea. Water is then poured on the two specimens. In the sterile leached-out earth the water immediately drains away. But in the spongy root-filled earth, the water is held. You apprehend its resting there near the mountain top – sustaining the forest – refreshing the air and slowly feeding the springs that supply the herds feeding in the valleys below. Strange that this little happening in nature would cause your eyes to smart – your throat to tighten – but it does! Just the good earth holding the water and in a movie! But it has Clark Gable holding Heddy LaMar beaten to a finish.

"This Living Earth Series is widely available. It is stated that every high school in California has purchased a set. Any branch of the Conservation Service can supply one or can give you information where one may be obtained.

"This one initial showing of the series to a small group of program chairmen representing but one-quarter of the state has, in six months that has elapsed, resulted in 36 written requests for extra listings, 18 bookings of films, and 'The Living Earth Series' has been solidly booked from the beginning – of course not all by garden clubs. The State has had the privilege and the cause of Conservation has had the benefit of 88 showings of this remarkable picture."

New Members of the New York Zoological Society

(Between March 1 and April 30)

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The Cordiers Are Coming!

At long last Charles and Emy Cordier are on the way home from the Congo with as exciting a shipment of living rarities as has ever reached these shores.

We plan to make an EVENT of their arrival in capital letters—a grand preview for Society members!

Everything working favorably, it will take place on Members' Day at the Zoo—and this is the best possible time to bring us new friends to see what the Society is and does, and to share in the values of membership.

BRING NEW MEMBER PROSPECTS TO THIS PARTY.

Date will be announced to you by mail.

Membership Committee
New York Zoological Society


NEW YORK ZOOLOGICAL SOCIETY

l. LII • No. 4 JULY - AUGUST, 1949

ANIMAL KINGDOM

SMITHSONIAN INSTITUTION
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THE MAGAZINE OF THE NEW YORK ZOOLOGICAL SOCIETY

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ANIMAL KINGDOM

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The Art of Zoo Management

IN THIS AGE when the inventive capacity of man seems to have no bounds, it would be careless to assume that progress is to be measured only by such near-miracles as radar and jet planes. Inventiveness is of course being applied in many different fields. Among these is the art of caring for and exhibiting wild animals in captivity. This is a specialized profession and, in passing, not a new one, as it stems from early periods of history. It has developed among widely divergent cultures and has received much impetus in Europe during the last century with the creation of zoological *gardens* and great private collections on extensive estates. For any vital "art" – and such it is – there are no visible limits to the possibilities of improvement. More and more, emphasis is being placed on keeping animals contented and under conditions that are as similar as possible to those of their natural environment.

Many different skills, functioning smoothly together, are needed for the successful operation of a large zoological park. Of course, the animal is "king" and its needs and comfort are the prime objective. Long experience and a very special kind of talent are required to keep many different kinds of animals, of widely varying temperaments, in good condition. Notable strides have been made in recent years in the matters of diet and health. These require skill of a high technical order, including the services of a veterinarian whose professional training is not less than that of other men in the medical profession whose work has to do with human *(Continued on inside back cover)*

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AUG 16 1949


ANIMAL
TREASURES
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OUR BELGIAN CONGO EXPEDITION COMES HOME

By CHARLES CORDIER

On October 10, 1947, the freighter *Tamerlane* sailed for the Belgian Congo and aboard were my wife, Emy, and myself as well as an inspiring mound of equipment for what we supposed would be a moderately long collecting trip of about eight months. *Twenty* months and five days later we came home, minus some of the bulkier equipment, in a DC-4 plane crammed to bursting with animals. Some of the reasons why those eight theoretical months stretched to twenty actual months will appear in this brief account of the New York Zoological Society's Belgian Congo Expedition.

It is 25 days to the Congo-mouth port of Matadi as the *Tamerlane* sails it, 25 days of nothing-to-do that were the last of their kind for more than a year and a half. It is 12 hours from Matadi to Leopoldville, the capital and administrative center of the Belgian Congo, by wood-burning, narrow-gauge railroad, and there (after a suitable wait of only ten days for our gear to clear through Customs) one connects with a Congo River freighter that crawls upstream for a thousand miles in 21 days and finally ties up at Stanleyville, at the head of river navigation.

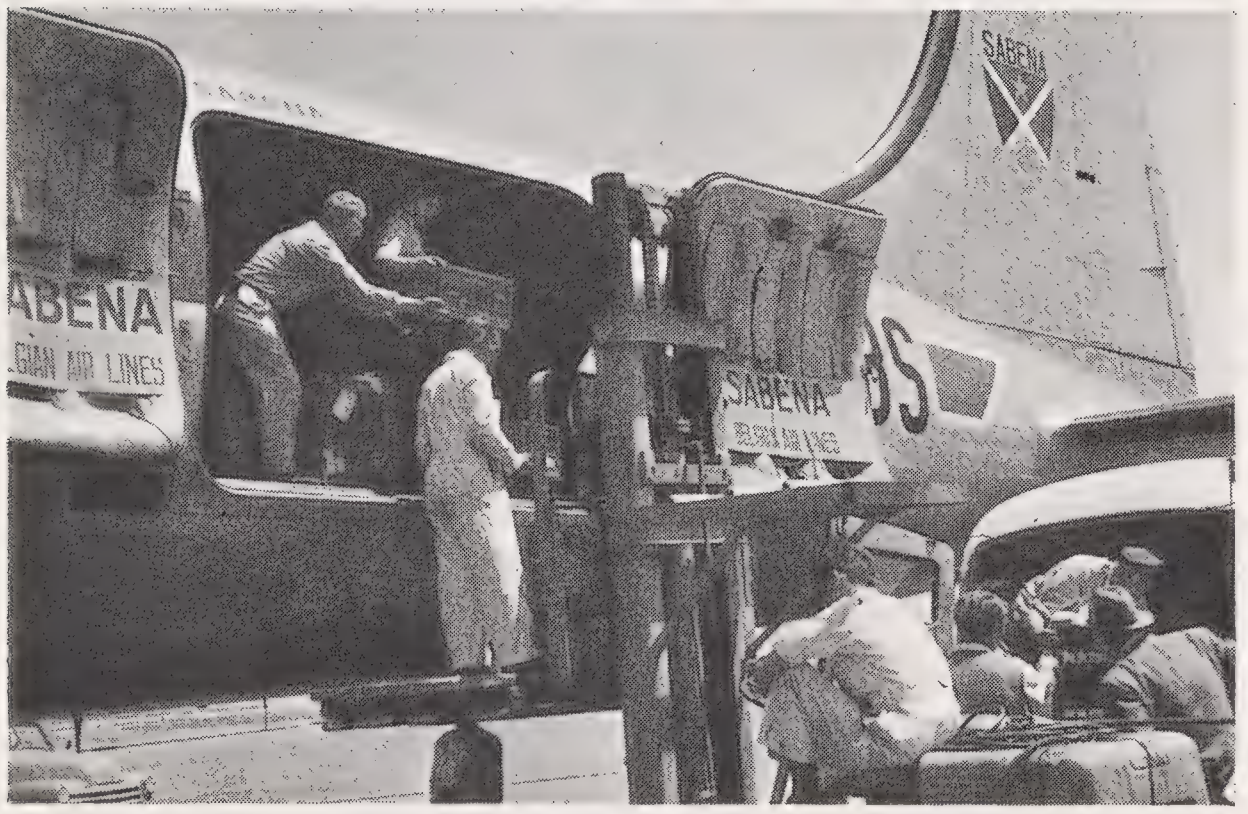
I give this time schedule in some detail, for it will be seen that already 57 days have elapsed after leaving New York — almost two months gone out of our theoretical eight, and we have merely arrived at the point from which we begin the search for *places* in which to search for *animals*.

That cruise up the Congo is something we will not soon forget. Our cabin was directly above the freighter's boiler and every afternoon between 4 and 6 p.m. we would moor at a landing to take on firewood. Thirteen men would lug the chunks aboard and drop them on the steel

Home with a great trophy! Charles Cordier (at left) and Mrs. Cordier hold a Congo Peacock chick for the inspection of Fairfield Osborn.



At noon on June 15 a DC-4 plane, chartered from Sabena-Belgian Airlines, dropped down at Idlewild International Airport —and our Belgian Congo collection was officially home. The interior of the plane was packed solid with cages, with only a narrow working corridor for the attendants.



(ABOVE) Bird cages start coming out of the "Flying Ark." (BELOW) Mrs. Cordier and friend —a mangabey—sit on the sidelines and watch.

deck. At every load, our bunks would jump. Generally the loading was finished by 4 a.m., and from then until daybreak we could sleep in peace. By day, our attempts at napping were punctuated by rifle fire, for the captain was a sworn enemy of crocodiles and kept an army rifle beside him on the deck immediately above us.

Wildlife as viewed from the river freighter was disappointingly thin — a few crocodiles, three or four monkeys, a fair number of black-

We needed sweet potato leaves for certain monkeys, and the A & P Food Stores came through. Here Earl R. French, national marketing director of the Atlantic Commission Co. (right), and General Curator Crandall, offer leaves to a mangabey held by Mrs. Cordier.





and-white Vulturine Sea Eagles, plenty of black-and-white Hornbills, and nothing else. Accustomed as I was to the vastly more plentiful mammal and bird life of the riverways of South and Central America, I took this as a disquieting omen. Later I was to have it more strongly impressed upon me that the chronically meat-craving natives do not get game merely by walking around the corner into the forest; the game has been pushed far back. The thick bush itself is somber and lifeless. Only once in more than a year and a half did I meet a band of baboons in the forest – although they were common enough along the roads – and never any other ground-dwelling mammals. Occasionally one would see a band of monkeys in the treetops, sometimes a few Giant Plantain-eaters or Hornbills. I have reference of course to mammal and bird life *in* the forest; from clearings or around villages, one could almost always see Plantain-eaters and Hornbills high in the distance. And as for the snakes – if they are supposed to be a hazard of jungle life in Africa, they are badly over-rated in the areas where I worked. Not one did I ever see in the forest. Only a few in rest houses, or crossing the road ahead of my jeep. The few that I saw close enough to identify were not poisonous.

Incidentally, while on the subject of the Congo forest, it seemed to me that the heat and the insect pests of the Congo are less oppressive and annoying than in the equatorial forest of South America. After all, the Congo basin has an average altitude of about 1,300 feet – a thousand feet more than the Amazon basin. Only once, while in a forest camp in the Congo, was I seriously annoyed by insects; that was when swarms of bees tried to alight on my sweat-stained shirt.

Before we set out from New York, General Curator Crandall handed me a list of the mammals, birds and reptiles he would like to have – or, at least, that *might* be collected and would be welcomed by the Zoological Society. It was quite a list and on it were the Giant Pangolin, the Potamogale or Water-shrew, a male Bongo, Mountain Gorillas, a female Okapi, the Congo Peacock, Giant Plantain-eaters and the Black Guineafowl, as well as about a hundred other but less spectacular animals.

Where to find them – in a forest of some 400,000 square miles?

Late in the afternoon two truckloads of animals rolled into the Zoo and the Congo collection was stored in the Aquatic Bird House.



Under the watchful eye of the General Curator some of the ibises and wading birds were liberated immediately from their travelling boxes.



Our first job was to find a suitable collecting base with good living accommodations, plenty of native help, plentiful food supplies – and in proximity, if possible, to good collecting areas. We also wanted to know particularly about the abundance, or scarcity, of the Congo Peacock in the wild, for it was obviously one of the major prizes.

So, before establishing a camp, we began a scouting trip by jeep, pulling out at every opportunity the colored drawings of the Congo Peacock that Lloyd Sandford had made for us. In and around Stanleyville the drawings brought no response so we took the road to Opala a hundred miles to the southwest.

The first likely native I spotted was an elderly worthy wearing a loosely woven brimless straw hat in which were stuck many bright feathers from the tail of a Giant Plantain-eater. The rest of his costume was a G-string and a tattered genet skin dangling below his knees. He was supervising the moving of his household effects by his two women and they were plodding stolidly along with headstrap loads of footstools, earthenware pots and plantains.

When I flourished the two pictures and spoke the one or two words of "book Swahili" that I knew, the old gentleman backed off one pace, stood at attention, and saluted smartly. I advanced a pace, holding out the pictures. He backed up and saluted again. This continued until I realized how useless it was to keep on.

It was only after two hours more of driving that I got up courage to show my pictures again, this time to a few loungers in a roadside village. Immediately they elicited excited mutterings, much craning of necks, and someone said "Itundu." That, I knew, was one of the native names for the Congo Peacock, and so I brought out my other Swahili phrase: "Ico wapi?" meaning "Where?"

Out of the babble of discussion that ensued I caught one word often repeated – "Yaolonga." That was a village some 30 miles further south; I remembered its name on my map. It was maddening not to know what all the discussion was about, for I was avid for every speck of information I could get about the "Itundu." However, a further journey to Yaolonga seemed indicated, and we started – only to get lost, fall in with a white rubber planter and spend the night in his comfortable house, and to go on our way the following day with two of his hunters and a cook boy. Later the planter even came to see us and introduced us to the acting village chief (the real chief was in jail). By way of making friends, I gave the chief *pro tem.* a ride in the jeep. He was childishly pleased, shouted and sang and winked and hailed all his friends. In the cold damp dawn he was on hand to be my guide into Congo Peacock territory.

Fortunately I was then in excellent physical condition and able to keep the pace of my guide and the hunters. They travelled the forest paths between a very fast pace and a trot, and kept that gait for four hours without a break. Then, to my relief, we met two hunters carrying spears and an enormous load of smoked antelope meat. Under the vine straps around one load were the wing feathers of a male Congo Peacock that had fallen into an antelope trap.

That encounter provided a short "breather" and we were off again. Once in a while, when I thought a rest was indicated, I would stop and say, "Itundu ico wapi?" – meaning, "Where's the Peacock?" Then they would slow down and make a sweeping gesture, as much as to say "Here – everywhere." To gain more time, I would reply, "Haico" – "There aren't any." That always brought an annoyed stamping of feet and a repetition of the arm-sweeping. But it gave me time to catch my breath.

Once, though, they stopped of their own accord to bend over a place where the hard earth of the trail had been scratched. One of the hunters said "Itundu," and I looked too, with rapidly beating heart, for it meant that I was on the right trail after those long preparatory months and their uncertainty as to exactly where, in the vast Congo forest, the Peacock might be found.

By nightfall I was back at the government resthouse, very tired, but contented with the firsthand knowledge that Congo Peacocks existed in this spot 100 miles southwest of Stanleyville. For proof I had the evidence of the feathers in the antelope meat, and the scratchings in the trail. Beyond that, I gathered from the natives, through the cook-interpreter, that the bird was scarce, mysterious, invisible.

What is more – although I have brought back



Among all the animal treasures and "first timers" in the Congo collection, this pair of Congo Peacocks is supreme because of the romantic history of the bird and the extraordinary efforts that had to be devoted to finding and capturing it. The male, in its dark and somber dress of shimmering purple and green, is on the left, and the more brightly colored female on the right. Altogether Charles Cordier brought seven of the birds — six males and a single female. And, as he says in his article, despite all the search for information that has been made since Dr. James P. Chapin discovered the Congo Peacock in 1936, many important facts about its life in the wild are still unknown.



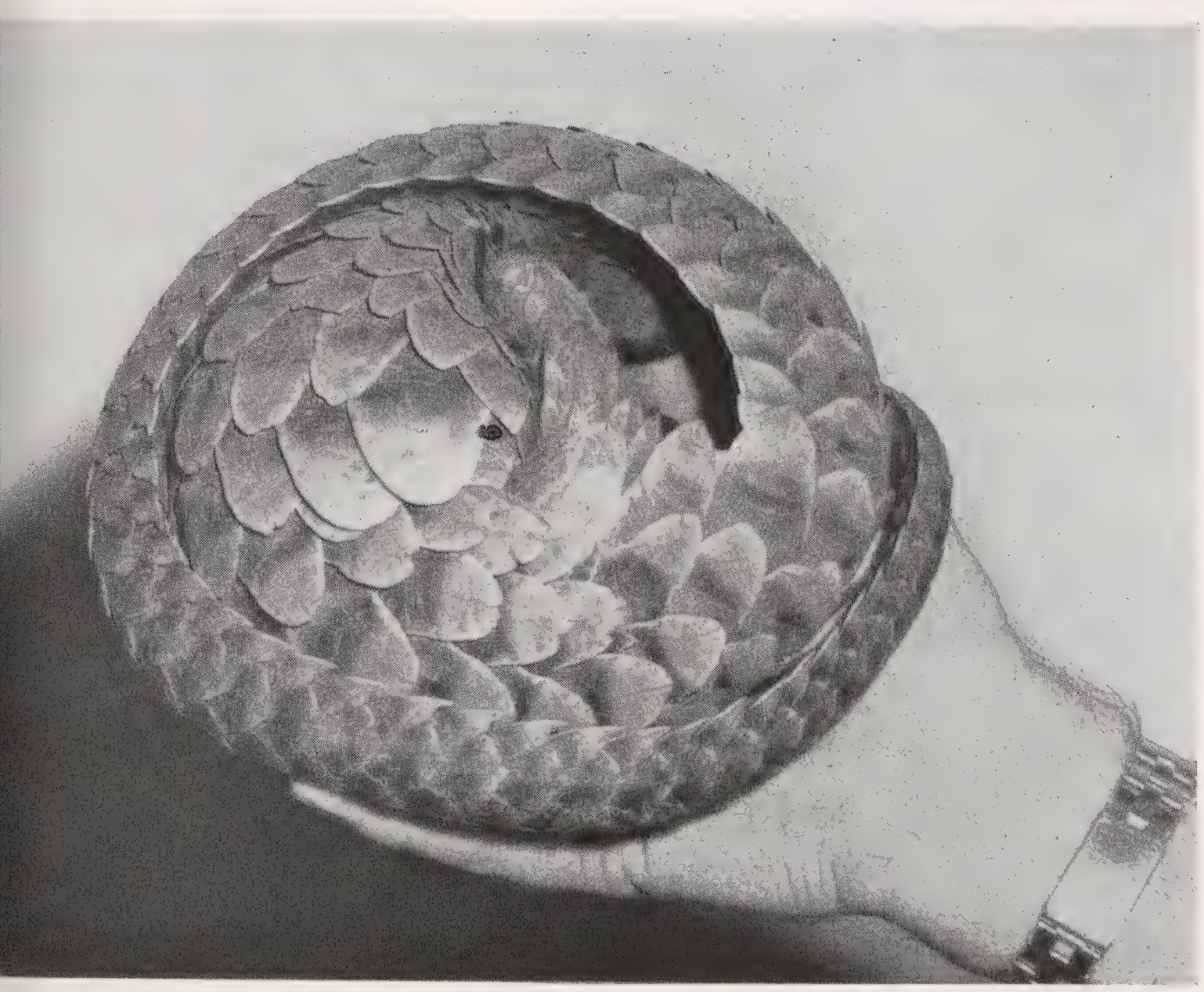
This is the first Giant Pangolin ever seen alive in America, and possibly the only one of this African species exhibited anywhere. This enormous eater of termites, approximately four feet long, did not long survive its trip to America and the species still stands as a challenge to the animal collector. Our specimen fed well on a substitute diet of ground meat, milk and eggs, but it was heavily infested with parasities. In the Congo forest it feeds on ground-nesting termites by night and sleeps through the day in a burrow or even in a shallow hole. This particular specimen was found asleep; a very short time later it was trussed up and carried into camp!

seven specimens alive, those qualifications still hold. No white man knows for sure where the Congo Peacock builds its nest, whether among the buttress roots of some giant forest tree, or in the broken stump of a tree some seven to ten feet above ground, or high up, many feet high, in a tree. Neither does anyone know the entire range of the bird, although my guess is that the range indicated on the Zoological Society's map that accompanied its Congo Newsletters of last year is fairly accurate. At least, I caught birds very close to the northern and western limits of that range. Nor can we do more than make surmises as to why the seeming occurrence of the bird is so spotty, with stretches of at least a hundred miles – through what seems to be identical forest – where it is not known to the natives. My own guess is that it is a bird that requires semi-dry forest, not periodically flooded as some areas are, and that it avoids the low regions. Also, that it tends to appear where certain favorite wild fruits are found, and to avoid regions lacking in this food. But all that is guess-work.

To resume the thread of my story, we were temporarily quartered in Stanleyville, we knew where to find Congo Peacocks, and now how about some of the other mammals and birds on the Zoological Society's list? More scouting was indicated, to the grasslands of the east and south. An 800-mile trip produced little of help,

Two species of Tree Pangolins are illustrated here, the White-bellied (right) and the Long-tailed (below). Both are much smaller than the Giant Pangolin, but their habits are much the same, except that they are tree-dwellers and feed exclusively on the kinds of termites that build only in trees. Like the Giant, when they come into captivity, they have to be shifted from this wild diet to a substitute food composed of meat, milk and egg, and after considerable coaxing some individuals do very well. Both of these Pangolins were fairly common, and many specimens were offered the Society's expedition. Natives often caught them at dusk while they were running on the ground, or captured them while cutting down palm trees, where they are frequently found curled up asleep. Tree Pangolins have strongly prehensile tails. For protection, they curl into a tight ball, as is demonstrated in the picture below.







The Spectral Galago is the smallest of the various species of African galagos, or "Bush-babies," and in this photograph it appears in approximately full size. The galagos are among the most primitive of the Primates. In the wild they feed on fruit, insects, possibly an occasional bird or birds' eggs. This particular specimen was caught by the expedition's cook, who set a snare in a tree a few hundred yards from camp.



The Cameroon Finfoot had never been seen alive in a zoological collection until the Society's expedition brought this specimen home. It is a relative of the Cranes, and is notable for the curiously lobed feet, with flaps of skin that act somewhat like fins when the bird swims. Found along creeks and small rivers, it paddles around in the reeds and vegetation along the bank, probably feeding on minnows, earthworms, water bugs and the like. It seems reluctant to fly.

although we did run across one natural flower field, high in the central mountain chain, with hundreds of brilliant sunbirds flitting about and hovering over the blossoms. Fourteen months later I captured there most of the sunbirds in our collection.

Everywhere we travelled we kept our eyes open for likely sites for a base camp, and early in January we selected the village of Bongena some 40 miles due east of Stanleyville. There was a good government rest house there, and it was on the direct road from the Kivu to Stanleyville, with produce-laden trucks passing twice a week. There were no Congo Peacocks in the immediate neighborhood and the natives were somewhat uncooperative, but the other advantages outweighed these drawbacks.

The happenings of the next three months have been made known to the Society's membership through the Congo Newsletters, and for brevity's sake I will not repeat them here – only to add as a footnote to that period's events that



Torday's Elephant Shrew (shown here in approximately life size) is one of the many small insectivores of Africa with long, "elephant-like" snouts. This particular form is a forest-dweller. It makes burrows and lives underground much of the time — unlike the Giant Elephant Shrew which does not, apparently, make burrows. When the first specimen of this Elephant Shrew came in, Mr. Cordier happened to be opening a termite nest. The mammal readily ate termites.

not one of the five Congo Peacocks nor the Giant Pangolin that came out of the Mangandu region lived to see New York. Some died of natural causes and the others were poisoned by one of our native keepers.

After the accident in February in which I broke my leg, I was more or less incapacitated until the following October, and of course the dream of an eight-months' trip had vanished. A good many small mammals and a few birds were brought in by natives during the spring, but the collection was by no means adequate, and the autumn or winter was no time to arrive in New York with a Congo collection; it meant we would have to stay until the spring of this year.

All this time, as I say, additions were coming in. Several times a week it would be necessary to drive into Stanleyville and the Congo grapevine had spread word all along the Stan road that the white man in the yellow automobile would pay cash for live animals. Seldom a trip but what we were flagged down by a boy or a man, sometimes a girl or an old woman, holding out a reed basket. And never, in all the scores or hundreds of times that that happened, did I stop to peer in the basket without excitement and anticipation. It *might* contain a Prize of Prizes — a Potamogale, perhaps, a Giant Elephant Shrew (that was before I was deluged with Elephant Shrews), or even a Congo Peacock. Our first Tree Pangolin came in that way, offered by a stout young fellow whose chief item of dress was



Not a great rarity — at least, in the Congo! — but interesting, nevertheless, is the Striped Grass Mouse which is prettily marked with golden stripes on a dark chocolate background. It is well described by its name, both as to appearance and habitat. In the wild it probably feeds on grass seeds and oily fruits. Village boys caught many specimens for the expedition by setting up a semi-circle of small nets and "beating" the game into them by thrashing the underbrush

a fragment of blue lace windowcurtain. A price of 30 to 35 francs – 65 to 75 cents – was mutually satisfactory. Giant Elephant Shrews could be had at the same rate, Blue Duiker antelopes, alive and generally trussed with vines to a pole, at 50 cents to $2, larger Duikers at $2.50 to $5, depending upon the condition of the animal and whether we wanted it for food or for the collection.

As the "zoo-in-Africa" started to grow, we needed larger daily supplies of meat, bananas, plantains and such vegetables as lettuce and carrots. Meat, particularly, got to be a serious problem, despite the fact that we had a kerosene-burning refrigerator and could hold supplies until needed. Several villagers professed to be *fundis* – specialists – in hunting, and we would lend our gun and cartridges. The village judge was the most smooth-talking of the *fundis*, and for a while he did bring in monkeys fairly regularly. Then his luck ran out and he gave up hunting, in disgust. His explanation was that the wife of one of our houseboys had certainly eaten the head of a monkey. . . .

On June 15 of last year – just a year to the day before our return to New York – we moved camp from Bongena 40 miles east of Stanleyville to Kisubi, only six miles from Stan but on the opposite (left) bank of the Congo. The river was 800 yards wide at that point, and a steel pontoon ferry insured connection with the town, but it was not rare to have to wait a couple of



Almost the first animal that Charles Cordier saw in the Belgian Congo was a specimen of Emin's Giant Rat — very dead — on the roof of a hut in a hunting camp deep in the forest. It was waiting its turn to be eaten by the native hunters. Subsequently three live specimens turned up, two reaching New York. This forest-dwelling rat has a body about 12 inches long.

hours for one's turn to go aboard — nor was it rare, either, for the gasoline motor to stop in mid-stream, whereupon one started floating toward the Atlantic a thousand miles away. But there was one considerable advantage, for the ferry curbed the impulse of casual tourists to visit us!

As soon as our new base camp was fitted with pens for antelopes, a monkey house, a small mammal house, a "pheasantry" with eight compartments for guineafowl and Congo Peacocks, it was time for me to start scouring the Congo for animals. Emy's job was to maintain the base and make sure we always had enough eggs, meat, bananas and the like; to train and keep under control the growing staff of houseboys and keepers. This required a good deal of executive ability, for near the end her staff included: 1 cook (for us and for the animals), 1 houseboy, 2 water carriers, 2 firewood suppliers, 2 night-watchmen, 1 police guard (to discourage thievery and help fight off the recurring invasions of driver ants), 2 termite collectors, 1 collector of live minnows, earthworms and parasol-tree fruit, 2 boys for cutting and drying grass (for animal



There are a number of kinds of Hyraces in Africa, some dwelling among rocks, others in flatter country. This particular one is Emin's Tree Hyrax of the forest. The natives generally are afraid of it, for no reason Mr. Cordier could determine. He found that among certain tribes, if a medicine man saw a Tree Hyrax, or even a bit of its fur, he dared not continue on his journey.

bedding), 2 weeding boys, and 6 boys and 1 headman for feeding and cleaning the collection.

This was a staff of 23 individuals, with wives and family problems to match. Emy had her hands full.

So did I, for I started making journeys of three to five weeks in an effort to get the really major items of our collection. From start to finish of the expedition I drove 29,000 miles by jeep or truck, most of the time over rain-washed, abominable roads in the forest, and collected animals at extreme points 800 miles apart. Nor was it possible to travel with a trained crew of native trappers who would act directly under my orders; the xenophobia of the natives was such that they would withhold food and information from such a crew. At every collecting point I had to start afresh – first to make arrangements with the colonial official in charge of the district, then to treat individually with whatever natives he felt could be spared from road or crop work. Once you got the hang of the system, it worked reasonably well, but it was time-consuming.

I did have one piece of luck; a 34-year-old Arab named Auguste Mwarabu, whom I had engaged as a carpenter, demonstrated so much ability that I promoted him to a kind of assistant collector. I could set up a collecting program and leave him in charge of it with considerable confidence.

A male Bongo was the one mammal that I had my heart set on capturing, and many months of inquiries finally led me to center my hopes on a region to the north of Stanleyville. Government officials and natives alike recommended that I get in touch with a native officer named Lupu, a very old man who had been one of Stanley's guides in his youth but who was still in excellent health and had great authority because he belonged to a ruling family.

Lupu was willing to be helpful, and under his



The Black Guineafowl of the Congo forest is one of the great prizes of the expedition, for this is the first time it has ever been exhibited alive. Several specimens were caught in snares set by native hunters. It is not a particularly attractive guineafowl, lacking the fine spots that distinguish other guineas. The bare places on the head are colored dark red; the tuft is slight.

orders a large piece of natural "meadow" in the midst of high forest was fenced in. This meadow (actually a better name would be "leech-infested swamp") was about six-tenths of a mile long and 300 yards wide, traversed for its entire length by a small brook. It was a natural feeding place and playground for Bongos, Sitatungas, Forest Buffaloes and Elephants. It looked good.

The natives worked hard, spurred by promises of good payment in case of captures; furthermore, any animal I did not want would be given to them. They got one buffalo that way. In the 16 places where game trails entered the meadow, openings were left in the fence and large traps with falling doors were set up. After about a week a Bongo actually did walk up to the pit that concealed the door-release, but turned back, and another simply jumped over the hole. Then elephants wrecked the fence . . . it was repaired . . . I set up a different kind of trap, with vine triggers, alongside the fence. . . .

All this took months, with occasional visits by Mwarabu or me to check progress. As it turned out, he was on the scene when something finally did happen. I had just delivered a truckload of animals to Emy at Kisubi, and hurried north to see what luck my carpenter-collector was having, and there I got the worst shock of my career.

An adult male Bongo – exactly what I wanted

(*Continued on Page* 134)



"The animal that never lets go" is a translation of one native name for the Potto, a lowly member of the Primates, and its reputation for biting and hanging on is so great that very few natives will even approach it. Actually, the Cordiers found that the Pottos in their collection quickly became tame and could be handled and petted, without ever attempting to bite them.

NEW YORK ZOOLOGICAL SOCIETY'S BELGIAN CONGO COLLECTION

Received June 15, 1949

MAMMALS:

4 Torday's Elephant Shrews – *Petrodromus tordayi* Thomas
1 Mountain Gorilla – *Gorilla gorilla berengei* Matschie
2 Wolf's Monkeys – *Cercopithecus mona wolfi* A. B. Meyer
1 Brazza's Monkey – *Cercopithecus neglectus* Schlegel
1 Hamlyn's Monkey – *Cercopithecus hamlyni* Pocock
2 L'hoest's Monkeys – *Cercopithecus l'hoesti l'hoesti* Sclater
3 Congo Spot-nosed Monkeys – *Cercopithecus nictitans ascanius* (Audebert)
1 Black Mangabey – *Cercocebus aterrimus* (Oudemans)
1 Johnston's Mangabey–*Cercocebus albigena johnstoni* (Lydekker)
3 Uele Colobus Monkeys – *Colobus abyssinicus uellensis* Matschie

4 Angola Colobus Monkeys – *Colobus polykomos angolensis* Sclater
2 Congo Pottos – *Perodicticus potto ibeanus* Thomas
2 Spectral Galagos – *Galago demidovii phasma* Cabrera and Ruxton
1 Giant Pangolin – *Smutsia gigantea* (Illiger)
3 White-bellied Tree Pangolins – *Phataginus tricuspis* (Rafinesque)
1 Long-tailed Tree Pangolin – *Uromanis longicauda·a* (Brisson)
3 Congo Aardvarks – *Orycteropus afer erikssoni* Lonnberg
2 Jackson's Flying Squirrels – *Anomalurus jacksoni jacksoni* de Winton
1 Rufous Tree Squirrel – *Heliosciurus rufobrachium rubricatus* Allen
2 Emin's Giant Rats – *Cricetomys dissimilis emini* Wroughton
2 Striped Grass Mice – *Lemniscomys striatus striatus* (Linnaeus)
2 Congo Brush-tailed Porcupines – *Atherurus africanus centralis* Thomas
3 Congo Civets – *Civettictis civetta congica* Cabrera
1 African Palm Civet – *Nandinia binotata* Gray
1 Victoria's Genet – *Genetta victoriae* Thomas
1 Equatorial Genet – *Genetta tigrina aequatorialis* Heuglin
3 Emin's Tree Hyrax – *Dendrohyrax dorsalis emini* Thomas
2 Weyns's Duikers – *Cephalophus callipygus weynsi* Thomas
5 Chestnut Duikers – *Cephalophus dorsalis castaneus* Thomas
3 Gaboon Duikers – *Cephalophus leucogaster* Gray
1 Yellow-backed Duiker – *Cephalophus silvicultur* (Afzelius)
5 Equatorial Blue Duikers – *Guevei coeruleus aequatorialis* Matschie
3 Simpson's Blue Duikers – *Guevei coeruleus simpsoni* Thomas
7 Water Chevrotains–*Hyemoschus aquaticus* (Ogilby)
1 Okapi – *Okapia johnstoni* (Sclater)

BIRDS:

2 White-crested Bitterns – *Tigriornis leucolopha* (Jardine)
2 Nile Hadada Ibises – *Hagedashia hagedash nilotica* Neumann
3 Hartlaub's Ducks – *Pteronetta hartlaubii hartlaubii* (Cassin)
1 Bates's Serpent-Eagle – *Dryotriorchis spectabilis batesi* Sharpe
1 Ituri Red-chested Goshawk – *Accipiter toussenelii canescens* Chapin
1 Vulturine Sea Eagle – *Gypohierax angolensis* (Gmelin)
1 Schubotz's Francolin – *Francolinus lathami schubotzi* Reichenow
8 Uele Crested Guineafowl – *Guttera plumifera schubotzi* Reichenow
5 Schouteden's Crested Guineafowl – *Guttera edouardi schoutedeni* Chapin
7 Black Guineafowl – *Phasidus niger* Cassin
7 Congo Peacocks – *Afropavo congensis* Chapin
1 Uganda Red-chested Rail – *Sarothrura rufa elizabethae* van Someren
5 Whiteside's Wood Rails – *Himantornis haematopus whitesidei* Sharpe
2 Lesser African Gallinules – *Gallinula angulata* Sundevall
1 Cameroon Finfoot – *Podica senegalensis camerunensis* Sjostedt
6 Loango Fruit Pigeons – *Treron calva calva* (Temminck)
12 Schlegel's Doves – *Calopelia brehmeri brehmeri* (Hartlaub)
1 North African Tambourine Dove – *Tympanistria tympanistria fraseri* Bonaparte
1 West African Red-billed Dove – *Turtur afer kilimensis* (Mearns)
2 Emin's Black-billed Touracos – *Turacus schuttii emini* Reichenow
2 Senegal Coucals – *Centropus senegalensis senegalensis* (Linnaeus)
1 West African Wood Owl – *Strix woodfordii nuchalis* (Sharpe)
6 Kivu Striated Colies – *Colius striatus kiwuensis* Reichenow
1 Chapin's Barbet – *Tricholaema hirsutum chapini* Bannerman
1 Gray-throated Barbet – *Gymnobucco bonapartei bonapartei* Hartlaub
1 Yellow-whiskered Bulbul – *Andropadus latirostris latirostris* Strickland
2 Congo Red-backed Scrub-robins – *Erythropygia leucophrys ruficauda* Sharpe
1 Doherty's Bush Shrike – *Telophorus dohertyi* (Rothschild)
1 Hartlaub's Chestnut-winged Glossy Starling – *Onychognathus fulgidus hartlaubi* Gray
2 Kivu Blue-headed Sunbirds – *Cyanomitra alinae vulcanorum* (Hartert)
4 Olive Sunbirds – *Cyanomitra olivacea ragazzii* (Salvadori)
5 Bronze Sunbirds – *Nectarinia kilimensis kilimensis* Shelley
3 Regal Sunbirds – *Cinnyris regius* Reichenow
2 Ruanda Double-collared Sunbirds – *Cinnyris afer graueri* Neumann
1 Uganda Buff-breasted Sunbird – *Cinnyris venustus igneiventris* Reichenow
1 Black-necked Weaver – *Ploceus nigricollis nigricollis* (Vieillot)
1 Vieillot's Black Weaver – *Ploceus nigerrimus* (Vieillot)
3 Magpie Mannikins – *Lonchura fringilloides* (Lafresnaye)

REPTILES:

2 Rhinoceros Vipers – *Bitis nasicornis* (Shaw)
1 Velvet Snake – *Boiga blandingii* (Hallowell)
2 Notched Hinge-backed Tortoises – *Kinixys erosa* (Schweigger)
3 Black-necked Agama Lizards – *Agama atricollis* Smith
1 Nile Monitor – *Varanus niloticus* (Linnaeus)

FISHES:

11 Climbing Perch – *Anabas* sp.
25 Top-minnows – *Haplochilus* sp.
15 Lyre-tails – *Aphyosemion* sp.
5 Catfish



Introducing Sumaili

By LEONARD J. GOSS

THE twenty-seventh day of November, 1948, was a Saturday; some may remember it better as the day the Thanksgiving turkey was finally transmuted into hash. But it was also the day the lean, sweating, very proud Headman of the village of Bilota, smack on the African equator, dived into a bush and came out with a baby Mountain Gorilla.

The Headman is named Sumaili and in accordance with respected Belgian Congo custom his Gorilla was named Sumaili, too – formally and officially, with typewritten *procès-verbal* and carbon copies in triplicate. Indeed, there are far more papers attesting Gorilla Sumaili's existence than Headman Sumaili's!

From that Saturday - after - Thanksgiving to Wednesday, June 15 of this year, is exactly 200 days in Time, nearly 8,000 miles in Distance, and Rags to Riches in baby Sumaili's career.

First – for Sumaili was a *very* young Gorilla, a mere seven months at most – a native girl became her foster-mother, and her home a thatched shed behind a Bilota hut. The next 150 days must have been the dullest ones of Sumaili's life, one day exactly like the day before. Then things began to happen –

A hot, tedious barge-ride 800 miles down the Congo, a glimpse of Leopoldville Zoo, then a small box closing out the world, the roar of great motors, brief halts at Accra on the Gold Coast, Dakar in Senegal, Santa Maria in the Azores, Gander in Newfoundland and the last halt of all at Idlewild Airport in New York City.

Since Charles and Emy Cordier surrendered Sumaili to the Zoological Park on June 15, another bewildering series of events has befallen her. Sleep and food, more sleep and more food, for the first 48 hours, and then scales, charts, cameras, thermometers, blood samples, tongue depressors and expert probing of eyes, ears, nose and throat. Most of the tests have given negative results, but not all, and Sumaili is still being treated for parasites. So far she seems to be responding favorably.

She made her debut, briefly, on Members' Day. A place is already reserved for her in the new Great Apes House we are about to build in the middle of the Zoological Park – the central place of honor, with enormous compartment indoors and capacious play-yard outside. Rags to Riches indeed – but nothing is too good for the only Mountain Gorilla in the United States!



The village of Bilota, near which Sumaili was captured, is exactly on the Equator.



For the first 48 hours, Sum
ian, Dr. Goss, began a ser



Carrying nets for the capture, as well as guns and spears for protection, hunters cross the river into gorilla country.

Photo Goldstein-Congopresse



A young gorilla has been surrounded and the hunters close in, encircling it with nets. This is the way Sumaili was caught.

Photo Goldstein-Congopresse

The Hospital attendant puts Sumaili on the scales. She weighed 16.5 pounds.

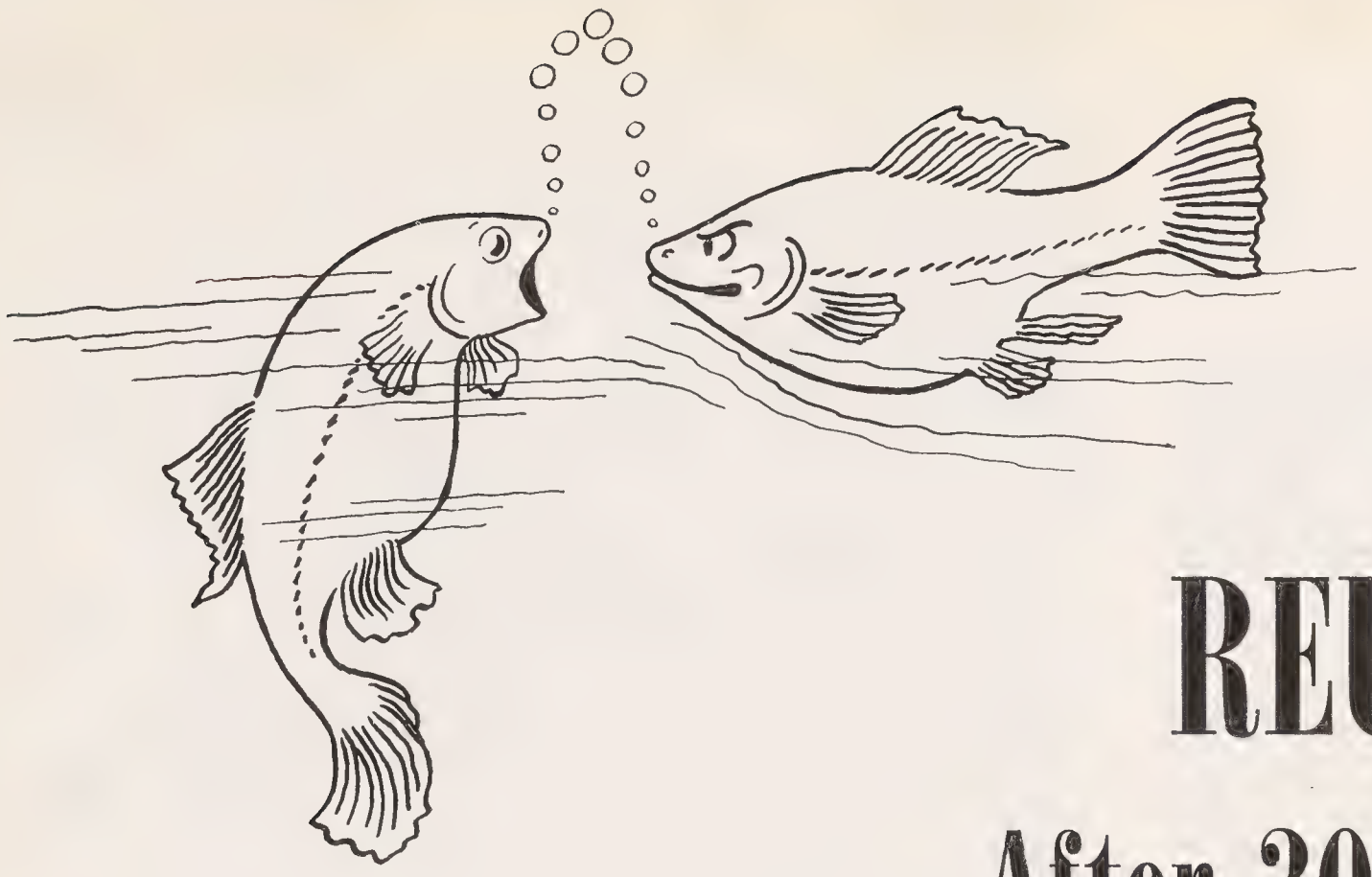


d ate; then our Veterinar-
nd physical examinations.

Sumaili took a liking to an old cotton pullover and was not happy unless it was with her, or around her, as bedtime came.

And so to bed. Sumaili always entered her sleeping box more willingly if Nurse and Attendant made a fuss over her.





"Well, you haven't changed much!"

REUNION

After 300,000 Years

By MYRON GORDON

In April of last year the Zoological Society's Aquarium Expedition returned from its "Long Distance Fishing Trip" to the Atlantic coastal rivers in the tropic jungles and swamplands of southeastern Mexico. The expedition was made in the hope of bringing back living stocks of elusive platyfishes and swordtails from the Rio Coatzacoalcos, a river known by the natives of the Isthmus of Tehuantepec as "The Lair of Serpents." The fishes were needed to test a genetic theory of the origin of cancer, an interpretation which is tied directly to the theory of the origin of species.

Modern ideas of the origin of species are influenced strongly by recent discoveries by geneticists who have been studying the interplay of the forces of reproduction, heredity and ecology. Not many years ago the geneticists' views on evolutionary theory were not taken seriously by other biologists. After all, non-geneticists said, what bearing has work done with tiny fruit-flies that are caught hovering about open garbage pails in city streets, upon what happens to wild animals living under natural conditions in primeval areas of the world? Non-geneticists saw no significance in the strange, milk-bottle-bred, freakish variations of eyeless, wingless and legless flies that emerged from maggots living on an artificial diet concocted from fermenting corn mash, yeast and molasses. The geneticist was called the "milk-bottle biologist" who rarely left the little, tight sanctuary of his laboratory. He was thought to be completely divorced from contact with the free-living creatures that populated the green fields, running brooks and forests.



Geneticists kept working, accumulating facts about the intricacies of the hereditary processes. They kept recording the origin and frequencies of the rare hereditary variations, the new mutations. If they had to breed, raise, study and count 50,000 flies to get a single mutant or new type, they would do so. Then another geneticist would raise another 50,000 flies in order to confirm or deny the results of the first. Their work was precise. Their conclusions were capable of being checked and rechecked by experiment.

Geneticists began to trace the specific effects of the environment. They studied the effects of special diets upon the expression of hereditary traits. At the same time they followed the effects of relative humidity, high and low temperatures, on pure-bred stocks of flies and learned that some

hereditary traits could be temporarily suppressed, other characters exaggerated. Flies were grown under 24 hours of daylight and under conditions of total darkness, and the influences were recorded. Long before the atomic bomb, geneticists learned to evaluate the hereditary consequences of exposing fruit flies and corn plants to the penetrating effects of radioactive chemicals. Using X-rays they learned to speed up the production of mutants (new forms) in plants and animals a hundred-fold, but unfortunately most of the new mutants were monstrosities. Ultra-violet light and X-ray machines became standard equipment in genetics laboratories. As their special requirements increased and their needs expanded, some geneticists became biochemists; others biophysicists.

Some geneticists reverted to their early naturalistic tendencies. They began collecting specimens living under completely natural conditions – in forests, in deserts, far up mountain slopes, away from the common haunts of men. And they found what they had predicted they would find, that natural populations were as varied as populations within urban areas. Most of the mutations which they had previously detected in laboratory cultures, reappeared among the offspring of normal, wild-caught insects. Geneticists, with the help of biological statisticians, began to apply the discoveries they made in the laboratory to natural populations. Their studies provided a strong impetus to a renewed and vigorous study of the old problem of evolution. They brought new ideas and techniques to the study of the origins of species, the most important being the experimental method.



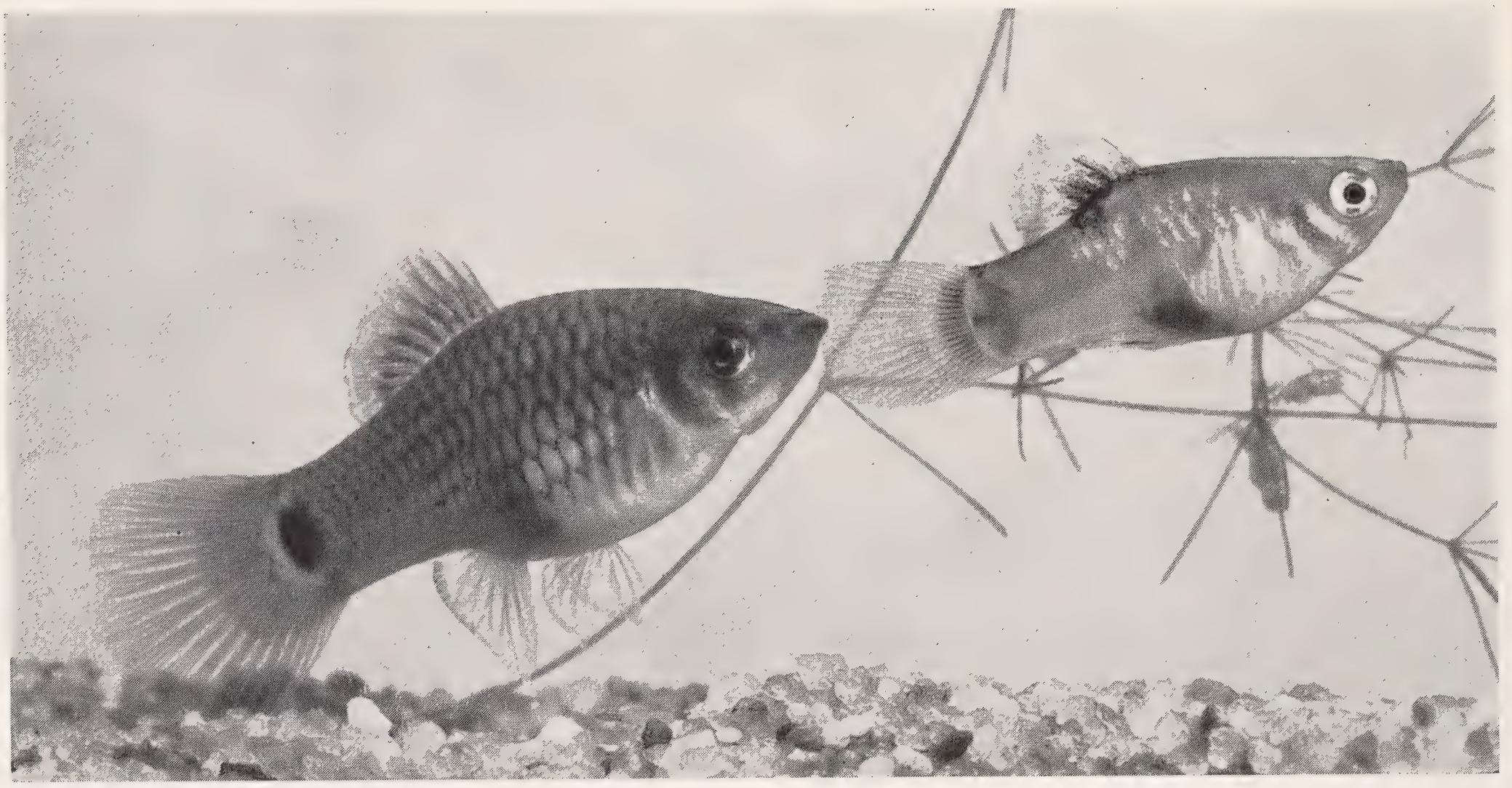
The geneticist's methods in the field are, in part, no different from those of the traditional biological explorer. He collects his plants and animals in remote areas, preserves them and then ships them to the laboratory for later study. But the field geneticist does not dry, skin or otherwise preserve his entire collection. His activities combine the methods of the collector for old fashioned natural history museums with the techniques used by a collector for zoological parks and botanic gardens. The field geneticist makes sure to bring some of the organisms back alive to his laboratory so that he can breed and raise them under uniform conditions and study the characters which they inherit.

Scientifically, up to the time of our visit in 1948, practically nothing had been known of the fishes of the Rio Coatzacoalcos and the smaller and more easterly Rio Tonalá, rivers that flow northward through the jungles of the Isthmus of Tehuantepec to the Atlantic. The Rio Tonalá is notable politically for its separates the swamplands and mangrove tangles of the southern Mexican states of Veracruz and Tabasco.

Our job on the recently completed Society's expedition to the river of "The Lair of Serpents" and to the Rio Tonalá was to collect as many fish species as we could. But we specially wanted hundreds of platyfish so that we would be enabled to determine accurately the kind and frequencies of the many color varieties of this fish in the two river populations. Fortunately we obtained more than 1,400 platyfish from the River of Serpents, and 50 miles farther to the southeast, in the Rio Tonalá, we got a smaller but an adequate platyfish sample.

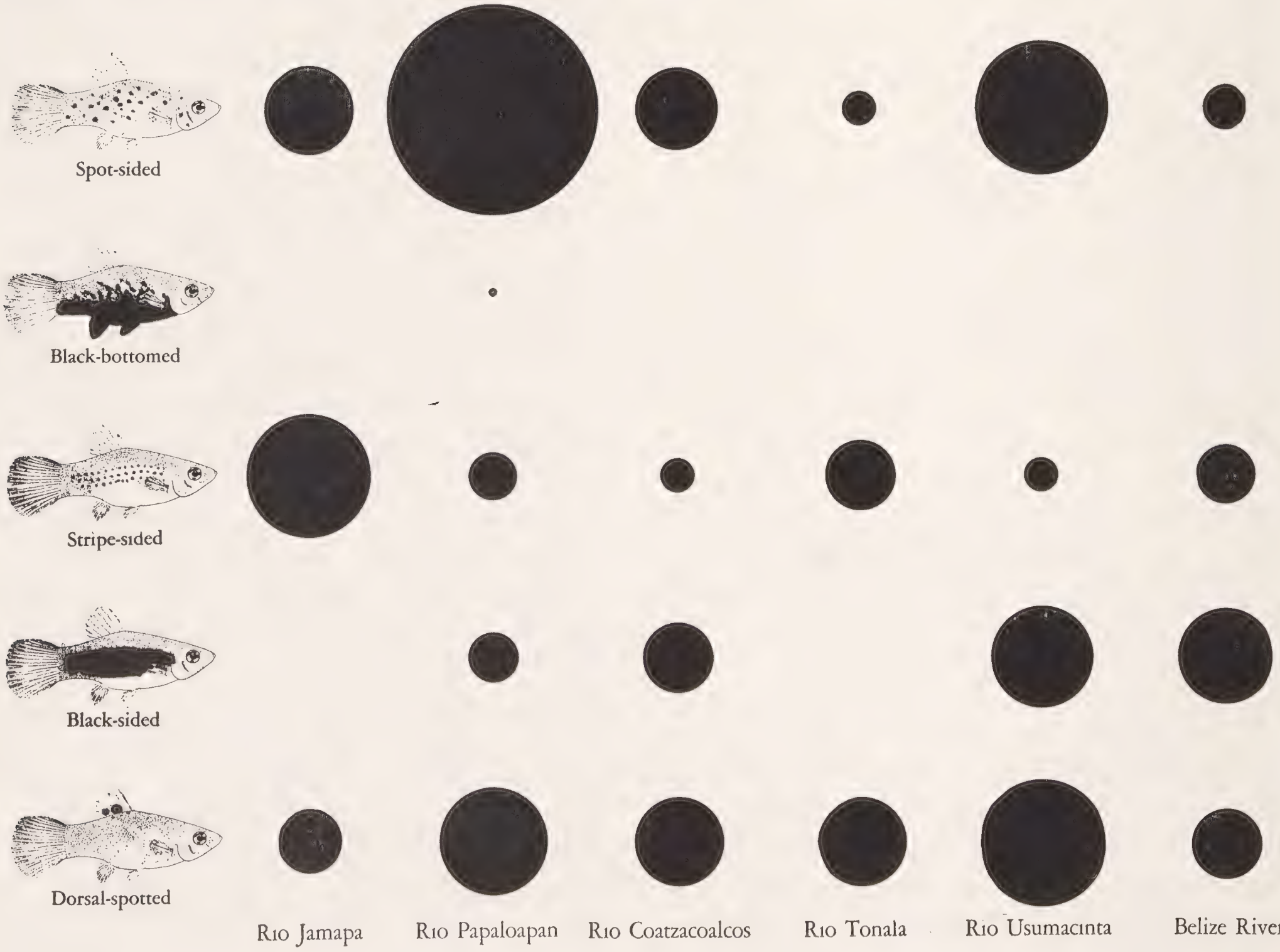
Previously, in the expeditions of 1932 and 1939, we obtained, farther to the north of the Rio Coatzacoalcos, a fine series of platyfish from the Rio Jamapa in Veracruz and from the Rio Papaloapan in Oaxaca. And in 1935 a group of ichthyologists from the University of Michigan collected more than 500 specimens of this same species farther to the southeast of the Rio Tonalá in the highland lakes of Peten in Guatemala and in the headwaters of the Rio Usumacinta.

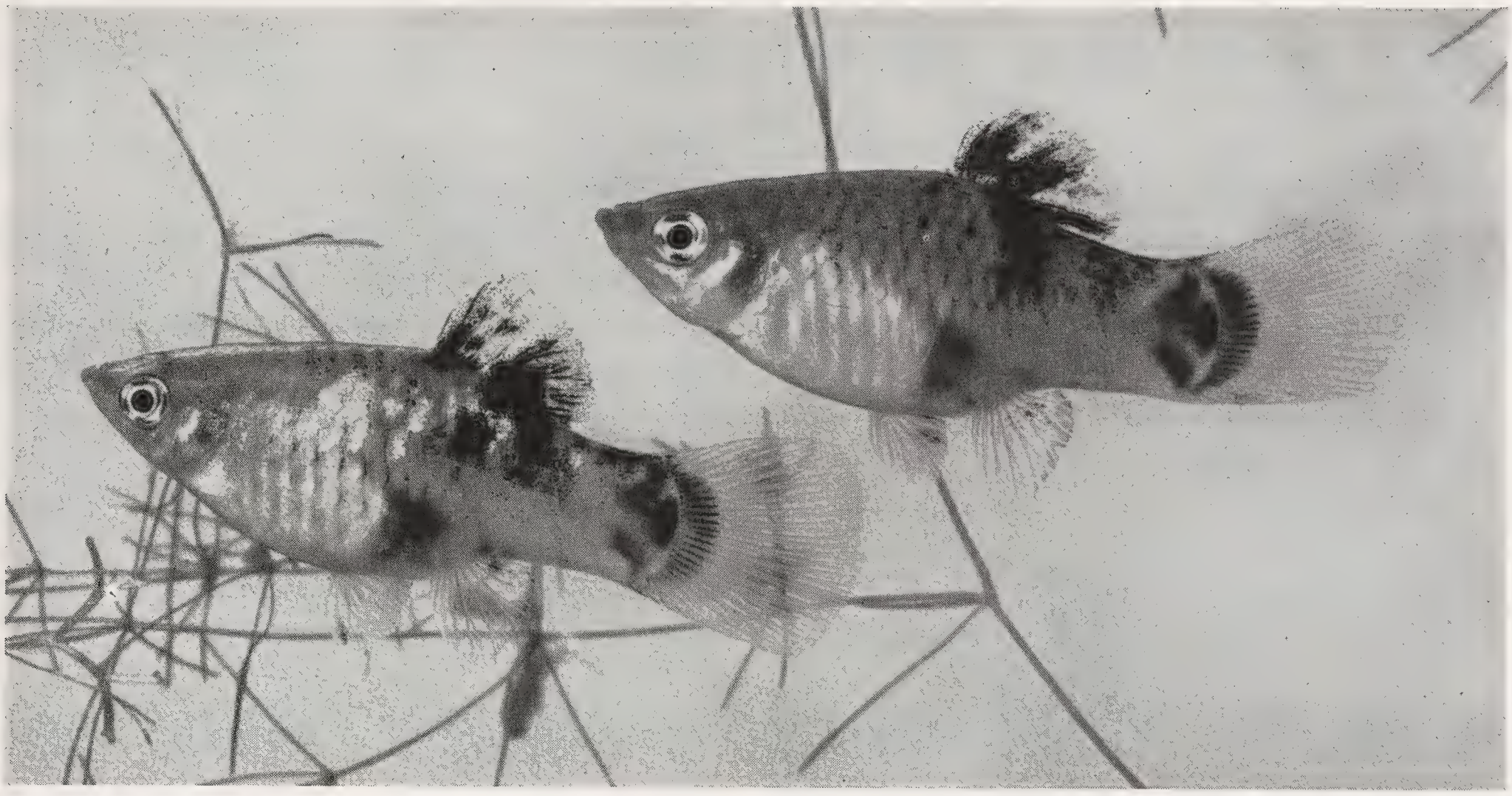
As fish systematists we could find no significant differences between the platyfish members of Rios Jamapa, Papaloapan, Coatzacoalcos, Tonalá and Usumacinta. The platyfishes from these five river populations constitute a single species, *Platypoecilus maculatus*. Yet by a genetic study of the kinds and frequencies of the platyfishes' easily distinguishable heritable color patterns, four definite population units were distinguished. Platyfish from the Rio Coatzacoalcos and Rio Tonalá



These are two of the fish reunited after 300,000 years. The male (right) has the dorsal-spotted pattern. In 29 days they produced young, two of which, grown up, are seen on the next page.

Different frequencies of five macromelanophore patterns in platys from six rivers of Mexico, Guatemala and British Honduras are represented by discs. Size indicates relative abundance.





In these offspring, the potentially malignant black in the dorsal fin spills over the body. If it becomes a melanoma, it will be the first produced by mating individuals of the same species.

The platyfish used in these investigations came from the rivers shown on this map. Geologically the area has not changed in 300,000 years, thus isolating the rivers' fishes for that period.



resembled each other in their color patterns but those from other rivers differed from each other in small but measurable details.

Geneticists found a group of color patterns which characterize the various river populations of the platyfishes. These are the "spotted body" patterns of which there are five so far known and they are of vital importance in cancer research:

1. Spot-sided
2. Stripe-sided
3. Spotted-belly
4. Spotted-dorsal-fin
5. Black-banded

The pigment cells or black chromatophores that make up the spotted series of patterns are large and are known as macromelanophores. The black pigment cells that cover the body as a whole are small; they are the micromelanophores. Macromelanophores are distinguishable from micromelanophores by the naked eye in most cases, and, definitely, by the aid of the microscope.

The platyfish of the Rio Papaloapan are outstanding – they have all five spotted patterns. Platyfish from the Rio Jamapa have the stripe-sided, spot-sided and spotted dorsal patterns but they lack two of them, one of which is black-banded. On the other hand, the platyfish living in the Rio Coatzacoalcos contain members having the black-banded pattern and it is very well represented among them.

Why are the individuals of the various river populations different? What made them different?

Geneticists say that, when a population of individuals is separated into two aggregations as by a geological accident, or by some other force, and that separation is maintained rigidly so that interbreeding between them is prevented, the two populations will in time become genetically distinct. The isolated populations become different owing to the mutational changes which constantly appear in each population. The important point is that the genic changes that appear in members of the first population are not likely to be the same as the mutations that occur in the second. In time the random mutations accumulate in each of the two populations and eventually they make the two groups recognizably different. The rapidity of the genic changes depends on the size of the breeding population as well as upon time. As genetically interpreted, the piling up of these small changes constitute the very beginning of the speciation process – a process which if continued long enough may eventually lead to the formation of new species.

Since the time factor was of great importance in our studies, I asked a geologist to tell me something about the earth history of Mexico's east coast. I particularly wanted to know the answer to this question: How long have the Mexican rivers of the Atlantic coast had essentially the same territories as they have today? He said the chances were that there had been no major change in the route the rivers take into the sea in the last 300,000 years. Another geologist said this was an extremely low figure.

What has all this to do with the origin of cancer?

Let us go back to the spotted body series of platyfish with their large, black pigment cells or macromelanophores. First, be it known that in more than 10,000 platyfishes collected from all of the five rivers of Mexico and Guatemala, among which 2,000 had a number of macromelanophores, not a single fish was found (in nature) with a black cancer or melanoma. Yet every living member having a macromelanophore pattern is potentially a cancer carrier. This can be proved easily.

All you have to do is to place a virgin platyfish (*Platypoecilus*) showing large black pigment cells and a virgin swordtail (*Xiphophorus*) of the opposite sex in an aquarium. The unlike fish species, having little choice in the matter, will, in most instances, mate and in time hybrids are born. The *black spotted hybrids develop melanomas.* But it must be emphasized, at this time, that their unspotted brother and sister hybrids escape the malady and are normal; some of them are larger, longer lived, and more vigorous than their platyfish and swordtail parents. This kind of hybridization experiment has been performed by many independent investigators in this country and in Europe. All of them reported essentially similar results.

But some observers may object to these experiments, saying such matings are unnatural because platyfish do not breed with swordtails under con-

ditions in nature. This is true; although platyfish and swordtails frequently live side by side and are caught together in their natural habitats in Mexican waterways, no hybrids between them have been found, as yet. But it must be added that hybridizations in nature between fish species as diverse as platyfish and swordtails are not uncommon in the scientific records.

Consider now, a series of experiments conducted with four species of platyfishes each from a different water system: Matings between the macromelanophore spotted Southern platyfish (*P. maculatus*) from the Rio Papaloapan and the Northern platyfish (*P. couchianus*) from the Rio Grande, species that are separated by 500 miles of seawater of the Gulf of Mexico, produced spotted hybrids which developed the greatest pigment cell abnormalities. Matings between the Southern spotted platyfish (*P. maculatus*) from the Rio Papaloapan and the spike-tailed platyfish (*P. xiphidium*) from the Rio Soto la Marina, species that are separated by 350 miles of seawater, produced spotted hybrids with definitely smaller pigmentary disturbances. Finally, the spotted hybrid of the spotted Southern platyfish and the Variatus platyfish from the Rio Panuco (the rivers' mouths are only 250 miles apart) are only slightly affected. Again let me emphasize the important point that the unspotted hybrids never develop melanotic tumors, and many of them are quite large, vigorous and long-lived.

The observer may object to these experiments, too, because the abnormal hybrids were, in part, the result of mating unlike species.

In order to overcome the objections arising from the mating of separate species, we needed platyfishes of the *same* species of different geographical origins, and therefore probably of different genetic constitutions. That is why we made our 8,000 mile fishing trip to the Rio Coatzacoalcos last year. We wanted living platyfish from this region so that we could cross them with the same platyfish species from the Rio Jamapa – a stock of which we have maintained in the Society's Genetics Laboratory since 1939.

In explaining the purpose of our collecting trip in his ANIMAL KINGDOM story, "Long Distance Fishing Trip," James W. Atz, the Aquarium's Assistant Curator and my invaluable field and laboratory associate, said:

"Specifically, we wanted to learn what happens when a spotted platyfish from one river system crossed with a platyfish of an identical species from another river system.

"Maybe nothing happens except a swarming brood of healthy platyfish.

"Or maybe something else happens and we learn a little more about the inheritance of cancer. . . ."



His story trailed off, unfinished. Another part of that story may now be told, for we have succeeded in reuniting members of two tribes of a single platyfish species that have been separated for 300,000 years.

The Rio Coatzacoalcos tribes of platyfish that we caught near the village of Minatitlan in southern Veracruz, were flown to Mexico City. After a short rest period there, our living platyfish, representing the first air-shipment of their kind out of Mexico City, were flown directly to New York City.

The first reunion of the scattered platyfish tribes in 300,000 years took place in the Society's Genetics Laboratory on May 20, 1948.

A Rio Coatzacoalcos male (*P. maculatus*) with several large black spots, all normal macromelanophores, in its dorsal fin, was placed in an aquarium. Then two vigorous, virgin females from our stock tank of pure Rio Jamapa stripe-sided platyfish (*P. maculatus*) were introduced into the same aquarium.

Would the different platyfish members from the Rio Jamapa tribe and from the Rio Coatzacoalcos tribe accept each other after being separated 3,000 centuries?

They did completely, within twenty-four hours.

On June 16, twenty-nine days after the reunion, one of the Jamapa females produced a large brood of young, and a day later so did the second.

Would those macromelanophores in the dorsal fin of the hybrids grow normally or atypically? We focused our magnifying glass on the newborn hybrid fish. We saw no large black pigment cells anywhere on their bodies. But within a week we discovered a few large black spots in the dorsal fins in some of the tribal hybrids. Those tell-tale macromelanophores were of great significance, for they appeared so early.

In all the pure platyfish that we previously had observed, the large black spots appeared only after the fish were about four to five months old. In some platyfish the spots in the dorsal fin required eight months to develop, and in others the marks were so small, even in fully mature fish, that a reading glass had to be applied before the important pigment cells could be detected.

Yet the offspring of the Rio Coatzacoalcos dorsal-spotted platyfish father and the Rio Jamapa platyfish mothers were practically born with macromelanophores in their top fins. This meant that the growth of the large black cells had been speeded. As these animals grew, the spots in the top fins became larger and larger until some of the macromelanophores "spilled over" to the body of the animal. It was obvious, when the hybrids were six months old, that the growth of macromelanophores was being stimulated abnormally. This response was almost identical with that previously observed when we crossed a dorsal-fin-spotted Rio Jamapa platyfish with a swordtail.

Since results obtained from crosses between members of the same species were essentially similar to those from matings between two unlike species, the factor of species hybridization should be regarded as of minor importance. *The significant point is that the parents used in each type of mating represent different populations, each of which has a distinct genetic constitution.*

Look at it this way.

One in about every five platyfish in the Rio Coatzacoalcos, in the Rio Jamapa, and in the three other rivers carries macromelanophores. Every one of over 2,000 of these *spotted* platyfish from the five rivers examined thus far, was perfectly normal as far as we could tell. Every one of their pure-bred spotted descendants was normal, too, at least as far as their large pigment cells were concerned. This must mean that the developmental rates of growth of the macromelanophores in the members of each pure, geographical population are under rigid genetic control.

But the hereditary forces, the genes, that limit the normal growth of the large pigment cells in the members of the Rio Coatzacoalcos platyfish, for example, cannot control the growth of the macromelanophores in the Coatzacoalcos-Jamapa hybrids. The *genetic balance* was upset by the intrusion of the Rio Jamapa platyfish genes in the Coatzacoalcos-Jamapa population hybrids.

WHAT IS THE NATURE of the genetic mechanism by which the potentially dangerous large black pigment cells are kept under control in the members of their own proper, pure, geographical populations?

There was a period far back in geological time when the platyfishes were like most fishes of their kind that are uniformly colored, unmarked by macromelanophores. A time came when the first "spotted" mutant platy appeared in a platyfish population, and transformed some previously existing cells into macromelanophores. The nature of the mutation process is not yet clear but it is believed that mutations act like enzymes and affect the body chemically. Like most mutations, the macromelanophore mutation was probably harmful. We know from many experiments that most mutations are not only deleterious but lethal. This is so because most mutations first upset an organism's established genetic balance and this has immediate repercussions on the chemical balance in the developing organism.

The newly created large pigment cells developing in the genetically unprepared platyfish, probably grew, multiplied without restraint, and produced a melanotic tumor. Perhaps lethal spotted mutations occurred several times in the evolutionary history of the platyfish before they finally became established in the population. Macromelanophores could have become established in the members of the population only because the platyfishes were made ready genetically, in advance.

We now have to account for what happened in the indefinite, but probably long, period between the time when the spotted gene was an unrestrained killer and the time when it was rendered harmless.

In that critical interval in the history of the

platyfish other mutations, having all sorts of physiological effects, were being produced from time to time. Most of these mutations, too, were either deleterious or lethal. The relatively few hereditary changes that persisted either were neutral in their effect upon the platyfish or contributed but a slight advantage to the mutant form. Many new genes may have had no specialized effects of their own, at the time of mutation, but developed important functions at a much later period, when they acted jointly with others, when they began to modify and control the action of certain other genes. Such mutations, known as "modifier" genes, probably accumulated in the members of a population owing to their neutrality in their host.

It appears to me that prior to the spotted mutation's successful establishment in the platyfish population, mutations which were to serve, in part, as modifiers and controllers of the activity of macromelanophores accumulated first and then neutralized the lethal effects of the spotted mutants when they reoccurred. The platyfish had to be made ready genetically for the coming of the spotted mutations. When ready, the platyfish accepted macromelanophores without danger to themselves.

It must be obvious that this explanation is pure speculation. Yet the hereditary factors for macromelanophores can be demonstrated, their frequency in a population measured. The hereditary modifiers of macromelanophore factors can be demonstrated also as well as modifiers of other hereditary pigment cell factors in these fishes.

DO THESE genetic experiments with geographical populations of fishes have any parallel in human biology? Separate human populations such as the present isolated populations of platyfishes in the various rivers of Mexico and Guatemala no longer exist. We are many thousands of centuries too late to do anything about keeping geographical groups of people "pure" even if that were possible or even desirable. A large part of the human species at the present time level of our civilization is a genetic mixture of many geographical types. Here is how the authors of "Heredity, Race and Society" sum up the point:

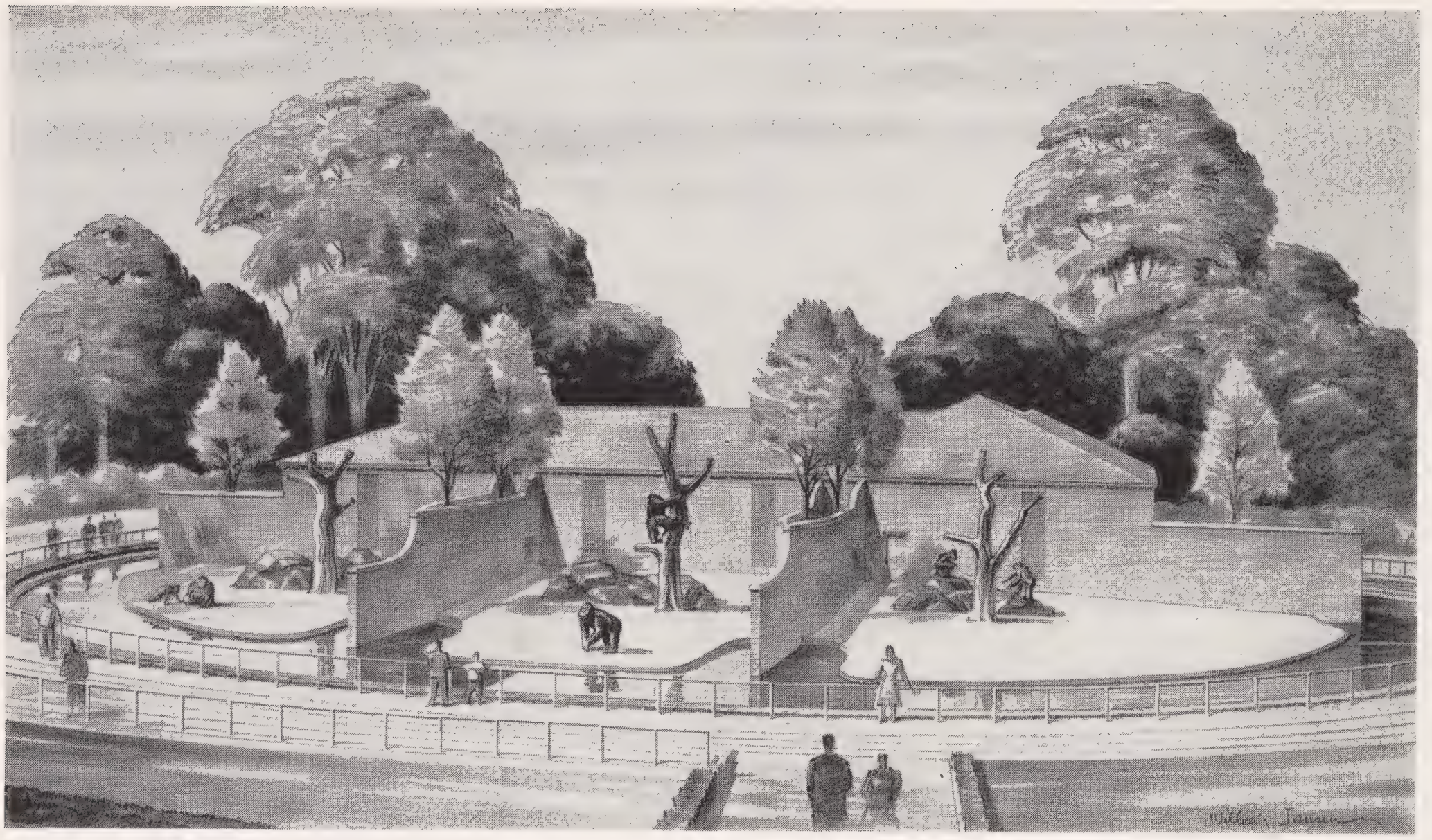
"If all peoples on earth were to intermarry at random, the resulting humanity would not, as is frequently but mistakenly supposed, be some kind of a compromise between all the now existing races. It would rather be an extremely variable lot: some persons resembling each of the now existing races would continue to be born, but other individuals would have combinations of traits that are rare or non-existent at present."

It is fortunate that we have in Mexico, Guatemala and in as yet undiscovered places in Central America, pure populations of the platyfish which we may collect, study, and subject to genetic analysis. These organisms are our tools, our living reagents by use of which we must learn by continuing research which genetic combinations lead to greater vigor, which produce abnormal growths.

If the practical aspects of these studies seem remotely associated with the immediate need for the discovery of the cause and the cure for cancer, the fact that follows should be kept in mind — we geneticists never forget it. The tumorous animals produced by our deliberate genetic crosses of fishes are used constantly as the aquatic equivalents of guinea-pigs in more "practical" research projects (there really is no line that divides the theoretical and practical advances in science) in our laboratory and those of other cancer research institutions.

Our attention is being focused sharply upon the nature of macromelanophores, for those are the cells which are capable of being changed radically from normal cells to cancerous ones by change of their genetic environment. The melanomas so produced in fishes contain almost a pure culture of melanoblasts, the cells characteristic of human and mouse melanomas. The melanoblasts of these three vertebrate representatives have almost identical structures when viewed under the microscope and this indicates that the melanoblasts of fish, mouse and man probably have the same phylogenetic history.

What chemical and physical forces can change normal fish macromelanophores to the neoplastic melanoblasts? What chemical and physical agents can reverse the process in changing the cancerous melanoblasts back to normal pigment cells? Those are the problems for today and tomorrow.



THE GREAT APES HOUSE, AS VISITORS WILL SEE THE ANIMALS IN SUMMER

We're Beginning to Build Again

AFTER A PERIOD OF WAITING for more favorable construction prices — an interminable wait, it sometimes seemed — the Zoological Society is now able to start three of its important new building projects. These are the Conservation Exhibit, the Great Apes House and the Penguin House.

Governor Thomas E. Dewey dedicated the 12-acre site of the Conservation Exhibit in a ground-breaking ceremony on July 25, preparatory to the laying in of basic services such as walks, water and electricity. More than a year will be required to complete the exhibit. It is being financed by the State of New York and $275,000 has been appropriated to date.

We expect to start construction during August for the Great Apes House, to exhibit Gorillas, Chimpanzees, Orang-utans and Gibbons. The Board of Estimate has appropriated $225,000, to be matched by the Society. The site is in the center of the Park, just south of the Reptile House, and will necessitate removing the present restaurant in that area. The building will be 126 feet long, with five outside moated areas extending the length of the installation to 208 feet.

The new Penguin House, just east of the Reptile House, is already under construction and will be finished in early winter. It will provide summer quarters, cooled to about 53 degrees, for King Penguins and other Antarctic species, which at present cannot be exhibited during hot weather. In winter, when the Penguins are out of doors, the building can be heated for other animals.



This "59-cent Dollar"— How It Works With Us

By DONALD T. CARLISLE

BACK in the Gay Nineties when the Society was born the dollar had a good reputation. It was a 100% American dollar and it did its full job.

A few hundred people and 250,000 of those old-fashioned dollars made the Zoo and the Zoological Society possible. This was the amount the original Society members subscribed to construct the Zoo as it was on Opening Day in 1899.

Those first members of the Society were deeply interested in its work, and over the years a high percentage of them continued their support so that the Society could advance its programs in research, education and conservation. To them we have been more than grateful.

In return for their thoughtfulness we developed our many services for members. The Society bulletin — now ANIMAL KINGDOM — goes back to our earliest days. Our scientific publications stem from our teen-age. As the years have gone by the Annual Meeting at the Waldorf and Members' Day at the Park have become notable functions in the life of the city. We like to do these things for our member friends — lots of things besides, like guided tours, special club parties and previews.

Membership in the Society is open to everyone who wants to join. Everybody is welcome. Once in a while, however — and only once in a while — we regret to report that we are imposed upon. Once in a while we find a member who asks for more than we think he's entitled to.

Now we come back to the present day 59¢ dollar!

Our annual membership dues have been kept at the modest sum of $10 from the start — worth $5.90 today on the current depreciated basis. The costs of our services in depreciated dollars have gone up. It costs us about $4 to edit and print six copies of ANIMAL KINGDOM every year. The cost of our midwinter Annual Meeting has almost tripled in recent years. Even the Members' Day party at the Park costs about $2 per head for every one who comes. It is easy to see that the Society makes little if any return on its membership dues.

Yet every now and then some member comes along with a request for unlimited passes for umpteen children to ride the Tractor Trains and the ponies, visit the Children's Zoo, take in all the pay-events in the Park on which our living so basically depends. The passes were never intended for unlimited distribution; they were, and are, provided as a courtesy to our members and their immediate families.

These infrequent cases of abuse perhaps do not add up to so much over a year's time, but they happen just often enough to be a vexation.

We don't *want* to raise dues. We might *have* to raise them, or cut out some privileges — which we don't want to do either. All we ask now is that you remember that it is out of our modest returns on the operation of the tractor trains and pony-rides and so on that we buy our new animals and make our improvements to the Park. If you *do* remember this you'll agree, we're sure, that we can't give our services away and stay in business.

We don't like this 59¢ dollar any better than you do.

The Conservation Foundation Starts Two Important Research Projects

By ROBERT G. SNIDER

THE first two major research projects to be undertaken by The Conservation Foundation were launched on July 1. Over a period of more than a year the Foundation's staff, in consultation with leading authorities in this country and abroad, has laid the plans and made preliminary arrangements for a survey of the incidence of soil erosion in North, Central and South America and for a survey of ground water shortage problem areas in the United States. The first of these projects is being undertaken as a cooperative venture between the Food and Agriculture Organization of the United Nations and the Foundation and will be under the technical direction of Dr. Mark Baldwin, a consultant to FAO and formerly a senior staff member of the U. S. Soil Survey. The second study, to be conducted as a research project by the Foundation but with the active cooperation of the several federal agencies concerned with the problem as well as the private organizations, will be under the technical direction of Dr. Harold E. Thomas, a leading ground water authority who is taking a leave of absence from the U. S. Geological Survey.

Under the terms of its charter, The Conservation Foundation is charged with the responsibility of carrying on research for the purpose of increasing public knowledge about renewable resources in order to achieve wise use of these resources. For approximately two years the Foundation's staff has examined a number of renewable resource problems in order to determine which of those were really critical and also needed thorough examination to provide facts — rather than opinions — on which subsequent action might be based. These two projects now under way appeared to be the most critical and at the same time were among those on which there was the least real knowledge. As time goes on, the research program of the Foundation will include similar studies on resource supply and studies on the most effective methods of disseminating information and on achieving application of resource techniques. In this latter area, the Foundation will of necessity deal with problems of an economic, social, and political nature which have not ordinarily been considered by private conservation organizations. It is the firm conviction of the Foundation's staff that in order to achieve effective conservation programs in this country and abroad, methods must be developed for individuals as well as governments to carry on these practices as normal "good business" methods.

The soil erosion survey is designed to throw light particularly on the problem in Latin America. In a recent report by the President's Council of Economic Advisors most of Latin America was described as underdeveloped. To the United States this means that we export approximately 70¢ worth of goods per capita per year to these countries as opposed to approximately $5.80 worth of goods per capita per year to the so-called developed countries. Under President Truman's "Point Four" program, technical assistance and private capital will be made available for development, but this development must be orderly. Without certain basic information and an awareness of its significance, serious errors can be made which will affect a nation's economy and, indirectly, ours for generations. Authoritative but

generalized reports indicate serious misuse of land and frequent consequent erosion in many parts of Latin America. This not only reduces the agricultural potential, through actual soil loss together with reduced buying power, lower standard of living, and frequently lower levels of literacy in local areas, but also affects cities and industry. Erosion results in silt-laden rivers. These make unsatisfactory and expensive municipal and industrial water and decrease the life of hydroelectric plants (the chief power source in Latin America) by filling up the lakes behind dams. But in Latin America as in the United States many people, even those in high authority, view erosion as a natural and inevitable phenomenon. If this point of view prevails widely, the effect of erosion which may be attributed to poor land use practices is not recognized as a major deterrent to economic development of the entire country. Once the extent and seriousness of erosion is known and this information is made available to the governments and the public of these nations as well as to the United States agencies, plans can be made to apply those conservation practices to the land which are suitable and are economically feasible in order to achieve economic development of the entire country. Without this knowledge and this action, major capital investments may be wiped out because a minor capital investment was overlooked through faulty understanding of the implications of the problem.

Thus the technical knowledge of the several organizations concerned, together with the official international connections of the Food and Agriculture Organization, are being joined at an early stage with the financial backing of the Foundation to pave the way for a rounded and balanced development.

UNLIKE soil erosion which anyone can see, at least after it is pointed out, the level of the underground water table will probably always remain a mystery to most people, but this level and its gradual rise or fall determines in many parts of the country whether the communities dependent on the supply of underground water will themselves rise or fall.

Under natural conditions a proportion of the rain falling on the earth seeps into the ground and into various strata of gravel to lie stored in what amounts to underground reservoirs. A major portion of the rain flows directly from the land to rivers and lakes and either runs off to the sea or evaporates. Gradually some of the underground water feeds into these lakes and streams. The rest lies in the ground until it is withdrawn by man through wells.

In the western part of this country underground water is a major and vital source of water supply for countless municipal and industrial uses as well as agricultural enterprise. In the more humid East, although ground water has many uses, the chief demand is for industrial purposes where temperature and quality are important. In each area business and people have come to depend on a continued supply of this water. In many instances serious declines in ground water level have occurred before any positive action has been taken. Sometimes this action has been too late and the result may then be the loss of industry and the loss of jobs, or at least no further expansion of the community.

Most of these problems have been considered local and, in the sense that ground water supply is essentially a local phenomenon, this approach has been correct. There is, however, a vast supply of heretofore uncoordinated and unanalyzed data which on investigation may prove to hold the key to the application of known general practices already tested. If water tables are declining, the grim answer may be: Use less water. On the other hand, there may be some methods of using land in such a way that more water will sink to the water table rather than run off directly to the ocean. There may be some methods of diverting surface water into underground storage through various engineering practices, or there may be some methods as yet unproved or unknown which will achieve conservation of this life blood of our economy.

The Foundation's survey is designed to point out those regions in which the ground water problem now or in the foreseeable future is likely to be serious; to describe the practices which may be applied in those regions; and, perhaps most important, to indicate the lines of further investigation which must be followed by private indus-

(*Continued on Page* 136)

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

Elephants Are Smart, But the Keeper Is Smarter

Ever since we acquired our three young African Elephants from the Belgian Congo in the fall of 1946, we have had trouble keeping a tree in their outside corral. Elephants love to push trees down, to get at the leaves, and any tree small enough to transplant was no problem at all to Zangelima, Bamangwa and Doruma. Iron guards and braces halted them hardly at all.

Keeper Montana of the Elephant House came up with an idea this summer. He had noticed that the elephants were timid about stepping on soft and yielding ground, and would not come into the area where their own droppings were piled up waiting for the removal truck. Montana suggested that an area about five feet in diameter be spaded up around a new, 35-foot-tall honey locust, and that the spaded circle be covered with elephant droppings.

The scheme worked and there have been no further attempts to push down the new tree.

Millions of Menhaden Die — Aquarium Tells Why

Menhaden, or Mossbunkers, are the second most important commercial fish of the Atlantic seaboard (Cod is first), with an annual catch of some 700,000,000 pounds. Commercial fishermen — to say nothing of the Department of Health — were therefore considerably alarmed early this summer when vast quantities of dead Menhaden were rolled up on the beaches in the lower bay. It was feared that some large-scale poisoning or disease was at work, and that this important source of animal foods, oil and fertilizers might be jeopardized.

Dr. Nigrelli, the Aquarium's pathologist, was called into consultation and was able to allay this particular fear. Microscopic examination of dead Menhaden revealed that the fish did not die of parasites or poisoning. Apparently they were all old fish at the end of their life-span. So large is the population of this fish that even the enormous numbers that die every year seem to make little difference in the catch of the next year.

Research Fellows Working In Zoological Park

Patterns of behavior in a varied group of animals — mammals, birds and reptiles — are being studied in the Zoological Park this summer by four behaviorists. This is the third summer of such research, which is laying the foundation for a much more ambitious program we hope to undertake shortly.

The research men, whose studies will continue until mid-September, are: Dr. Llewellyn T. Evans, until recently Assistant Professor of Anatomy at Long Island Medical College and now Research Associate at the American Museum of Natural History; Dieter Burckhardt, graduate student in zoology at Basel University, Switzerland; John V. Quaranta, graduate student in experimental psychology, Fordham University; and Joseph Murnin, a graduate student in experimental psychology at Pennsylvania State College.

Dr. John Bentinck-Smith, research associate at the Angell Memorial Animal Hospital in Boston, has been appointed as the first summer Veterinary Research Fellow in our Animal Hospital, and will pursue his studies there until September 15.

Work of the Behavior Research Fellows is being coordinated by Dr. C. R. Carpenter of the



New York Journal-American Photo

A highlighted moment in the career of Pete, the Society's elderly Hippopotamus, last March 3 when he made his first descent into his bath after being locked out six days while the worn steps were repaired. We were afraid he could not climb the steps again, but he managed it.

Department of Psychology of Pennsylvania State College and Dr. Bentinck-Smith's work is under the direction of our veterinarian, Dr. Leonard J. Goss.

Pete Is Indeed the Dean of Hippopotamuses

Although for several years we have been almost certain that "Peter the Great" (better known simply as "Pete"), our aged Hippopotamus, was the oldest one of his kind in captivity, it is only recently that we have confirmation.

On July 13 Pete was 46 years old, having been born in the Central Park Menagerie on July 13, 1903. He was acquired by the Zoological Park on July 14, 1906, at the age of three years and one day.

The animal we were uncertain about, that might have challenged Pete's claim to the record, was Betsy II, a long-lived female in the Amsterdam Zoo. Information from abroad left us in doubt as to whether Betsy survived the war.

Now General Curator Crandall has received the following communication from Dr. A. L. J. Sunier, director of the Amsterdam Zoo:

"Your old male hippopotamus is indeed at this moment older than our old female was when it died. That old female was bought from Hagenbeck on the 29th of March, 1898, and according

to an entry in our book of pedigree it must have been 18 months old when it arrived here. As it died on the 8th of January, 1940, it must have attained an age of nearly 43¼ years. It apparently died from old age. The last months of its life it was not ill, but it grew weaker every day."

Thus it appears that 46 years is an extremely advanced age for a Hippopotamus – and Pete is showing signs of his great age. He spends a great deal of time in his swimming pool, the weight of his great body supported by the water, and it is obvious that he has difficulty ascending the steps from the pool, so that we were concerned for him last winter when it was necessary for several days to lock him out of the pool in order that the worn steps might be repaired. Pete managed to waddle into the pool and out again as soon as the steps were repaired, and a few hours later he went into the pool for a good soaking and stayed there three days without once coming out.

We Are "Teaching the Teachers" How to Use the Zoo

The schools of New York City are making good use of the Zoological Park as a teaching adjunct – last year, for example, 2,229 classes came from 1,651 schools – but the staff has always felt that our services could be used more effectively if teachers were aware of all of them, and were better-informed about the animal collections.

This fall we will begin a series of two-hour lectures and demonstrations, over a period of fifteen weeks, for the instruction of a test group of 20 to 30 teachers, mostly from schools in the immediate vicinity of the Zoo. The program has been approved as an "In-Service Course" by the Board of Education and teachers will receive credit for attending it. In formulating the program, we had the enthusiastic cooperation of the Bronx Community Council.

Stalactites? We Grow Our Own!

Stalactites and stalagmites, the one hanging from the roof and the other projecting upward from the floor, are familiar to most persons who have visited limestone caves. They are hardly to be expected in New York City, however, and it



Pencil stalactites form a stone curtain under the fountain. Some are six to eight feet long.

was with surprise – and some chagrin – that we discovered a magnificent "forest" of them in the Zoological Park this summer.

The Park's plumbers discovered them when they had occasion to go into the pipe gallery underneath the Rockefeller Fountain in the Concourse parking circle. The ceiling is thickly hung with hundreds of pencil stalactites of hard limestone, the thickness of a finger, some of them six to eight feet long. Stalagmites, built up on the base of the gallery by the slow drip of limestone-bearing water, are shorter and stubbier.

The Rockefeller Fountain was the gift of William Rockefeller to the Zoological Park in 1902, and was imported from Como, Italy. Originally it stood on Baird Court in front of the present Heads & Horns Museum, and was moved to its present site in 1909. Not within the memories of our present plumbers has it been necessary to enter the pipe gallery supplying water to the basins above, and consequently we did not realize that slow seepage has been going on disintegrating the limestone basins and ornamental figures. If not checked, the stone might eventually "melt" away. Steps are now being taken to stop the leaks and repair the ravages of time.

Jackson Hole Wildlife Park Starts Its New Season

Fourteen research students and three assistants are working at the Jackson Hole Wildlife Park in Wyoming this summer – the third research season and the second during which the Park has been officially open to the public. Last summer's research has already produced several technical papers for publication in *Zoologica* and more will be forthcoming as a result of this season's work in bacteriology, ornithology, elk and moose behavior, fish parasitology, limnology, beaver habits and botany.

Director James R. Simon reports that at the opening of the Wildlife Park in mid-June there were about 40 elk and 29 buffalo in the Buffalo Pasture, but that after the calving season the elk herd will be split and about 20 of the animals released. The buffalo have produced eight calves and it will be necessary to dispose of approximately ten buffalo this year.



The Silky Anteater of Central and South America is rarely seen in zoological parks because of the difficulty of keeping it alive; its normal food is termites and it does not adjust easily to a substitute diet of chopped meat, egg and milk. However, we have recently received a fine specimen from Costa Rica and it is thriving in our Nursery. Unfortunately, it sleeps all day!

Fifty "First-timers" Are Listed on New Signboard in Zoo

In celebration of its fiftieth anniversary year, the Zoological Park has set up a double signboard, 24 feet long and 8 feet high, on Baird Court in front of the Administration Building. One side calls attention to plans for the future development of the Zoo, and the other lists fifty "first time on exhibition in America" mammals, birds and reptiles that have been seen in the New York Zoological Park since November 8, 1899. They are:

Duck-billed Platypus
Koala
Yapock
Malayan Tree Shrew
Philippine Tarsier
Vampire Bat
Gorilla
Giant Armadillo
Brannick's Giant Rat
Haitian Hutia
Spectacled Bear
Tibetan Blue Bear
Atlantic Walrus
Pigmy Elephant
Sumatran Rhinoceros
Baird's Tapir
Abyssinian Wild Ass
Mongolian Wild Horse
Barren Ground Muskox
European Bison
Blue Sheep
Pere David's Deer
Bongo
Okapi
Pigmy Hippopotamus
Giant Pangolin
King Penguin
Galapagos Albatross
Giant Petrel
Flightless Cormorant
Shoe-bill
Hammer-head
Wattled Ibis
Wattled Guan
Rheinart's Argus Peasant
Australian Bustard
Kaka
Milky Eagle-owl
Oil Bird
Snow-cap Hummingbird
Guatemalan Quetzal
Scarlet Cock-of-the-Rock
Umbrella Bird
Three-wattled Bell-bird
Prince Rudolph's Blue Bird of Paradise
Congo Peacock
Black Guineafowl
Komodo Monitor
Green Mamba
Black Spitting Cobra

These "fifty firsts" could easily have been increased to a hundred and fifty, but lack of space on the signboard dictated the selection of the better-known or more spectacular mammals and birds.

Our Arowana Is Growing Fast

In the last issue of ANIMAL KINGDOM we reported the arrival at the Aquarium of an Arowana, *Osteoglossum bicirrhosum,* from Brazil, the first specimen to be seen here in ten years. Two months ago it was just a baby, two inches long; since then it has grown to eight inches and has had to be moved to a larger tank so its growth would not be stunted.

It is, of course, still a comparative baby – an adult reaches a length of at least three feet – and the Aquarium staff has hopes of coaxing it up to several times its present length. It has a voracious appetite for cockroaches and flies, but will also take bits of meat. The roaches and flies float and the fish has no trouble snapping them up, being normally a surface-feeder. The meat sinks to the bottom of the tank and the Arowana has learned to sink down, turn sidewise and engulf the meat from the corner of its mouth.

Belgian Congo Expedition

(*Continued from Page* 112)

– had entered one of the traps. According to instructions, the natives had woven leafy branches into the stockade until the fence was Bongo-tight, and after a week the animal was tame enough to come up to anyone who brought him manioc and banana leaves.

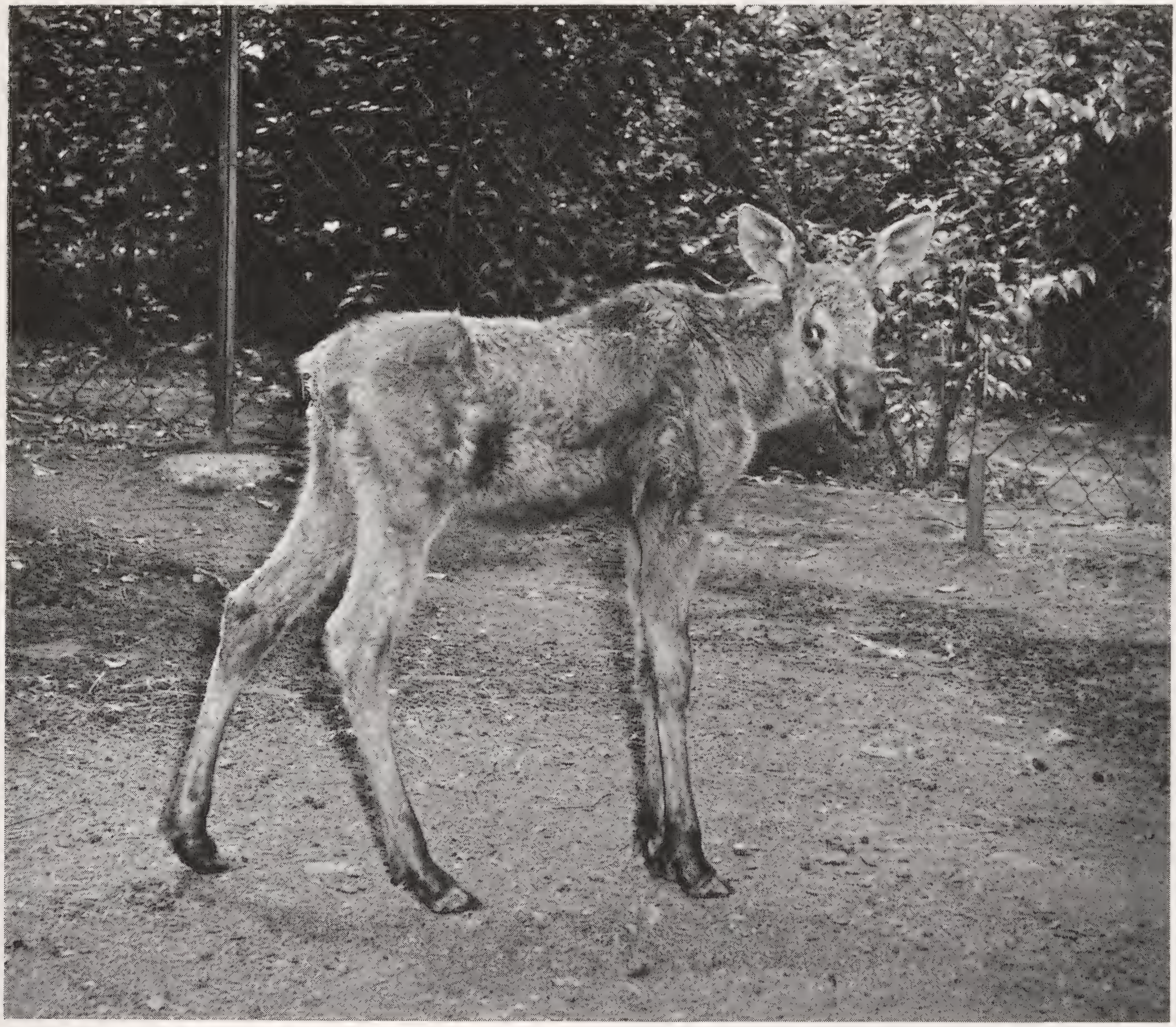
Mwarabu had sentries posted, according to orders, but they were restive and thinking about the cotton they ought to be picking, and the horseflies were pestering the Bongo. So, against orders but forced by circumstances, Mwarabu decided to move the animal.

Under Lupu's direction, a wide path was cut from the meadow to the village of Boma Hai four miles away. My big crates were stored in the village, and on the day set for removal, eighty natives started carrying one crate out to the meadow, slung on 30-foot poles.

After about a quarter of a mile they set the crate down and simply revolted at more work. They said it was foolish to carry an animal in a box – they would carry it out trussed to a pole, the way their fathers and their grandfathers carried animals. Mwarabu was helpless; all he could do was insist that the three native police guards maintain the status quo while he sped away on his bicycle to find Lupu some 10 miles away.

He found Lupu . . . and returned with him just as the carrying party reached the highway out of the forest with the Bongo on a pole. They set it down to parley, and at that instant the Bongo struggled and died.

Hearing about that incident was for me the blackest period of my stay in the Congo, I think, with the exception of the hours I lay in the Ayena swamp with a broken leg.



Young Moose are always news—and good news—in the Zoological Park. On June 3 a young male was born in our collection and is doing well; in addition to two quarts of milk a day, which it drinks from a pan, it has been nibbling grain and eating browse. It is growing fast.

Time kept creeping on, and we never did have another chance at a Bongo.

But, little by little, other things were coming in. I was constantly on the go, for months, starting hunting parties and coming back to get whatever they brought in. Only once did I see a live Congo Peacock in the bush; that was near Yolombo, far southwest of Stanleyville, at a spot two miles off the road in heavy forest. It had been caught in a foot sling and at our approach it just managed to tear loose and take off. But it served as proof that this was Peacock territory, and scores of natives set out many hundreds of snares, so that during the next four weeks I received three good males and a dying female with three 5-days-old chicks. All three males and one of the chicks are in the Bronx Zoo right now.

As the time approached for our return home, we had a very welcome visit, near the end of May, from Mr. and Mrs. Laurance Rockefeller. They were able to see most of the prizes of the collection, and Mr. Rockefeller undertook to arrange for a Sabena-Belgian Airlines plane to bring us directly home from Stanleyville, and through his intervention, to make available to us a baby Mountain Gorilla and an adult male Okapi that had been captured by Government hunters. Both those animals were restricted to Government capture, and I had made no attempt to get them myself.

The Zoological Society realized the plight we would be in with a plane packed solidly with animals, and sent George Scott, the Headkeeper of Birds, out to Stanleyville by plane to help us on the way home. Without him, I don't see how we could have managed, for he turned to with a will and got the hang of things instantly.

Now, at the end, I would like to express our thanks for the help that was so cordially given us by Dr. Els, the Provincial Veterinarian in Stanleyville, and Mrs. Els; by M. Buysschaert, the Administrator of Stanleyville Territory; and by M. and Mme. Godard and M. and Mme. Wathar at Ikela and Yolombo respectively.

Conservation Foundation

(*Continued from Page* 129)

try and by government to determine how water can best and most economically be conserved. Most enthusiastic cooperation by the various agencies of the Department of Interior and Department of Agriculture and the U. S. Army's Corps of Engineers has been offered in the carrying out of this study. Private industry, individually and through some of its national organizations, has offered assistance.

Thus, within a year the Foundation expects to have information never before available on two problems of vital importance to every American who pays taxes or has any connection with American business – one problem at home, another abroad. During this year it will also be the responsibility of the Foundation to plan the dissemination of this information in such a way that it will be used effectively to achieve permanent conservation of these renewable resources.

PUBLICATIONS OF INTEREST

THE NATURAL HISTORY OF MOSQUITOES, by Marston Bates. 379 pp., 9 figures, 16 black and white plates. The Macmillan Company, New York, 1949. $5.00.

Occasionally a book fills a need far beyond the apparent scope of its title. Such a book is "The Natural History of Mosquitoes" by Dr. Marston Bates, at present a staff member of the International Health Division of the Rockefeller Foundation.

It treats of mosquitoes as something more than a social or taxonomic problem. It happily does not become involved in a discussion of control techniques nor does it furnish systematic keys for mosquito identification. Instead, it brings together an amazing amount of well-organized material on mosquito behavior, ecology, mosquitoes as vectors of disease, the proper use of technical terms, the conduct of research and laboratory techniques, the solution of the species question.

The bibliography alone occupies 48 pages and the index is thoughtfully conceived.

The ecologist, behaviorist, physician and student of biology will find this book a most valuable addition to his reference library. The general reader will be intrigued by the wealth of accessible information which it contains. Dr. Bates, with his enviable background of both field and laboratory experience gained in many parts of the world, has compiled a much-needed volume.

— Brayton Eddy.

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The Art of Zoo Management

(*Continued from Editorial Page*)

health. In some respects the work of the animal doctor is more perplexing than that of the human doctor. For one thing, the former's patients cannot describe their ailments to him. This fact no doubt has its compensations. Preventive medicine is at a high premium with animals – an excellent thing in itself. Extraordinary achievements in solving the dietary and psychological needs of rare animals are taken for granted. Take the case of our two shy, temperamental and generally "difficult" Duck-billed Platypuses that are thriving today, having come from Australia more than two years ago. To illustrate the matter further, one needs only to turn back to one of our early Guide-books, published in 1907, in which the following statement is recorded: "Whenever one [a gorilla] arrives, all persons interested are advised to see it *immediately* – before it dies of sullenness, lack of exercise, and indigestion." Or, again, a few years later: "There is not the slightest reason to hope that an adult gorilla, either male or female, will ever be seen living in a zoological park or garden." Experience and increase of "know-how" have scotched such pessimistic prophecies, although at the time they were solidly buttressed by practical experience here and abroad. Innumerable achievements in maintaining rare and tender species in conditions of health and contentment could be cited.

In our own Zoological Park, in addition to all the above, facilities that contribute to the convenience and happiness of visitors numbering almost three million a year must be maintained and constantly improved. There is no doubt about it – zoo management is an ever-developing profession.

Fairfield Osborn


NEW YORK ZOOLOGICAL SOCIETY

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ANIMAL KINGDOM

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NATIONAL MUSEUM

THE MAGAZINE OF THE NEW YORK ZOOLOGICAL SOCIETY

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ANIMAL KINGDOM

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Aspect of Wilderness

IT IS A VALLEY that sometimes, at dawn or dusk, seems suspended between two worlds, so majestic is the alchemy of sky, mountains and river. The intimacy of its name, Jackson Hole, denies its expanse – half a thousand square miles of valley floor ramparted by mountains. It is no longer a true wilderness, though first known to pioneers but a life-time ago. Highways cut it, a town and a few settlements and ranches lie within it, bridges span the beautiful river and its tributaries, yet here the wilderness clings. A day's fishing is adorned by flights of waterfowl, glimpses of moose or mule deer, or the pistol-crack of a beaver's tail proclaiming "I was here first – these are my waters!" Black bears occasionally maraud a larder and coyotes in autumn sing from the hill-slopes. Yes, the wilderness still clings to this incomparable region. In this continent or another there could be no happier meeting place of man and nature. May it ever continue so.

Fairfield Osborn

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OCT 11 1949



SIMLA

Our New Field Laboratory In Trinidad

By WILLIAM BEEBE

AEONS AGO, the waves of the Atlantic rolled over all of the northeast corner of South America. Milleniums later, waves of another kind heaved themselves slowly down from the north. The bottom of the shallow sea moved, rose and curved in successive, lofty folds, and the new-formed Andes shook off fishes and dolphins and sprouted palms and jungles. Seaweed gave place to orchids, hummingbirds supplanted flyingfish. Valleys were formed, the northeastern tip of the continent settled slightly in its bed, and the map as we know it came into being, a matter of fifteen million years ago.

With only a few insignificant breaks the great range of mountains which begins at the Straits of Magellan, extends five thousand miles northward. There it sends a branch eastward, passing Rancho Grande in Venezuela, on and on until it sinks into the ocean at the tip of the long finger peninsula of Paria. The muddy waters of the Dragon's Mouth cover it, but it surges into the air again after seven miles of submergence, and forms the northern ranges of our island.

Today we find Trinidad as a rectangular chip, roughly thirty by fifty miles, with sizeable promontories extending from three of its four corners. In total extent it is slightly larger than Rhode Island and somewhat smaller than Lancashire. We

Our new field station of Simla (see white arrow) commands a valley-view in north-central Trinidad. This relief map shows the sweep of the Andes, finally dying out on tiny Tobago.

Map by Creole Petroleum Corp.

know considerable about the fossil life of its younger days, shells, crabs, fish, even the ancestor of the modern banana, and still more recently mastodons and giant sloths.

Historically speaking, the island was first seen by Christopher Columbus in 1496, and from the south, at sea, 450 years have made little difference, so that today, as to his eyes, three sister peaks justify his name of Trinidad.

After the mountains had lifted their heads above the sea, little rivers began to flow down their sides and have helped to carve a series of charming valleys. Near the north-central part is the Valley of Arima.

In the heart and center of this valley – named by some nostalgic Englishman, Verdant Vale – there arises a sentinel hill, fairly steep on all sides but one. On the summit, resting as casually and much more securely than the Ark on Ararat, is the new hill station of the New York Zoological Society, most appropriately named Simla. Comparison with Noah's craft has no further force at present, for the Ark was the greatest Zoo the world of fact or legend has ever known, while our new laboratory is at present barren of life save for sundry tenants. Among these is a group of geckos, a scattering of scorpions, a clot of vampires, besides house wrens and Palm Tanagers complete with nests. Stingless bees also call Simla home, and solitary wasps have added to the architectural features sundry earthern jugs, spheres, tunnels and spindles. As to more rationally assembled wild life a few weeks of our coming expedition will soon set that right.

Simla itself is not very old. It was built thirty years ago as a hill domicile for a governor, but never so used. Later it was visited by the Prince of Wales and later readied as a temporary residence for the Duke of Kent and his bride. For a time it functioned as a week-end abode for the owner of the adjacent Verdant Vale cocoa estate. And now, together with twenty-two acres of land, it has become a permanent zoological station for the Department of Tropical Research of the New York Zoological Society.

The building was well and truly planned by the original architect, thirty-six by one hundred feet, of sound cedar planks and asbestos roof. The entire west end is a single large room apparently made to order for a laboratory, cement floored, and eighteen by thirty-six feet, with the peaked and raftered ceiling rising three and twenty feet. There is hardly a square foot of glass in the whole building, the walls being of wire screening, protected by fold upon fold of swinging venetian door screens. The eaves are wondrous wide, shunting outward both blazing sun and tropical downpours.

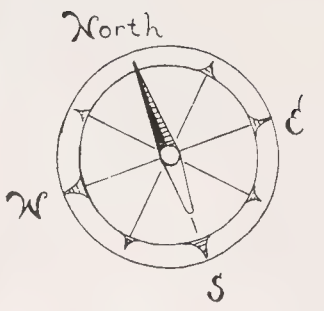
There is only one way to cope with the complexity and bewildering beauty of the surrounding outlook, and that is to box Simla like a compass.

To the North, at the rim of the flower-bordered lawn there rises a low stone wall, and from this there falls away a downward slope dotted with fruit trees, while at the bottom are rooted an assortment of tall jungle trees, with their summit foliage at eye level. Among them we recognize pink and yellow poui, cecropia, cypre trees with bunches of mistletoe, sand box, rubber, bois immortel, and a mighty cedar whose smallest twigs are fragrant. The eye is led up and up, across intervening valleys to the summits of a semicircle of mountains, an inspiring amphitheatre of forest, the swan song of the Andes themselves. Cutting the silhouette at the far end is the great top of Morne Bleu, 2,781 feet, second highest mountain in Trinidad.

If we stand on the wall we can see a distant cluster of roofs four miles up the Arima Valley. This is the hospitable Spring Hill estate of Dr. and Mrs. Newcome Wright, who, ever since we first became interested in Simla have been the *dei ex machina* who have smoothed our way and anticipated our needs.

We shift to the East, to a wholly different outlook. This end of Simla is bounded by a large covered porch – whose destiny is indubitably to house series of insectaries and terrariums. I sit down on a stone step and am instantly enveloped with a cloud of small black insects, all focussing on a narrow, amber-colored tunnel, a colony of innocuous stingless trigonid bees, whose door-way I had inadvertently shaded, thereby committing the same discourtesy as did Alexander the Great





Looking north from the large room that forms the west end of the building; this is the room that was "made to order for a laboratory." In the distance the jungle thrusts its tree crowns up to eye level.

some twenty-three centuries ago in the case of Diogenes and his tub. I moved and the swarm forgave me.

I look out over a level, grassy compound, terminating at the edge of the plantation. This entrance is as majestic as the colonnade of a Grecian temple, a jungle portico with a full dozen great mahogany boles supporting a roof of deep green foliage. Their limbs are covered with hanging gardens of night-blooming cereus and vanilla vines, and their great roots appear and disappear like ultra-lazy dolphins. Even the lawn is not like ordinary lawns for it is bounded by a half-dozen feathery palms, and the far corner is pink by reflection from a canopy of scarlet bloom.

If we walk through the glade of mahogany giants, we soon come to a grassy stretch, only the grass blades are six inches through, their surface of polished jade, curving sixty feet into the air. It is the first of a dozen clumps of full-grown bamboo. A trail, or trace as they call it in Trinidad, leads along the mountain ridge, slowly rising, until at the end of a half mile, it ends, very surprisingly, at a group of ever-flowing springs. These come into sight from beneath a cluster of gigantic boulders and by way of cement basins and a generous pipe line, supply us with adequate pure water. From the porch there is no hint of trail or spring. The jungle which clothes our land to its boundary appears unbroken.

Our northern and eastern outlooks might be called reasonable ones, adequate and predictable tropical vistas, but they provide no preparation for the southern scene. Here we look straight down Arima Valley, its sides rising in moderate mountainous slopes, the farthest forming an enormous, open-armed V which overlooks the great flat center of Trinidad. Dim in the distance we can make out the flattened isolated mesa or massif of Tamana. The wooded floor of the valley is broken only by bits of the winding asphalt road and the roof on the adjacent estate of our nearest neighbor, a retired British wing-commander. Four miles beyond the last visible curve of the road lies the village of Arima, an important source of our material supplies.

When we climb to the summit of the mountain to the southeast we look down, a few miles away, upon the wide-sprawled American Army Base.

But the incredible foreground is what gives the feeling of unreality in this tropical scene; charming, but altogether incongruous from the point of view of a zoological station. It is pure medieval Italian, sheer Riviera. We may start at the quaint overhanging eaves; first a wide herbaceous border, plumbago, russellia, begonias, bougainvillea, amaryllis, vincas and ixora. Next a bit of lawn and a long stretch of four-foot wall, backing a sunken, crescent-shaped terrace floored with a very lovely irregular mosaic of blue stone. The bow-shaped outer circumference of the terrace is, believe it or not, castellated, and looks down a sheer twelve feet to the end of the winding approach road, which in turn is banked by a third terrace. This

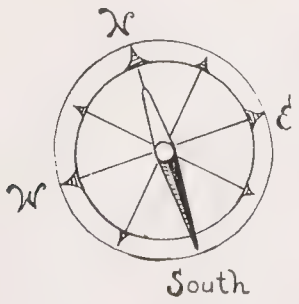
at last overlooks tropical growths. Perhaps the most bizarre architectural character is a series of four and eighty, count them, pink-tinted clay jardinières (for lack of a better word), filled with every imaginable kind of plant, from bougainvilleas to royal palms. Terrace number two is guarded by a trio of cypresses, rising tall and compact, and incongruously beloved by Kiskadees and Palm Tanagers. On this South side one feels that a casual walk should be with plumed hat, rapier and quizzing glass rather than with butterfly net and binoculars. Yet, upon our third visit, even iron seats and castellated walls seemed less incongruous and more charming. They were ours and therefore home-like.

We swing to the West and complete the full circle. As everywhere else we find the sky bisected by the serrated ridge of surrounding mountains, the only break in the jungle being a distant, half-overgrown, vertical scar, marking the quarry used by the American forces during the war. The land slopes sharply down just beyond the talus below Simla ramparts. But the dominant feature, the focus of the eye on this side, is a single tree, a glorious flamboyant at present in full scarlet bloom. It is rooted on the very lawn itself, and the branches stretch out in all directions, several at the very door of the laboratory and conveniently at eye-height. The overhead canopy is blazing red and emerald. Strange additions at this season are long, sinuous green pods of this year's unripened fruit, while here and there dangle brown, contorted pods of the previous year's crop, gaping, seedless, but still clinging fast, like forgotten wisps of tinsel on a discarded Christmas tree.

The main branches are free of their own foliage and bloom — these are terminal — but alive with alien growths, ferns, lichens, moss and begonias, an ecological study for years for zoologist or botanist. Every possible niche supports an airplant, hundreds altogether of many sorts, whose strange inflorescence rise on parti-colored stalks from their origin in the heart of rosetted leaves. The trunk of the flamboyant is a nexus of the winding, skinny fingers of the air-roots of orchids. At the present moment three clusters of an infinitely sweet-scented ivory and wax, lavender and white orchid dangle from their stalks of staggered leaves. Its name is *Aerides odorata* and as we look, a beautiful tailless papilio butterfly alights and feeds.

So much for a quick, superficial, fallible-human-eye-view of Simla's environs. Every few minutes, however, changes were wrought on all four sides — changes and shifts, surprises and small magics which would certainly continue as long as we remained or returned. A small *russellia* was only a bush of dull scarlet blooms, but within seconds the air above it was charged with electric atoms, four species of glittering hummingbirds, bombarding our eyes with diminutive heliograph glints of turquoise, emerald and sapphire from crowns, breasts and backs.

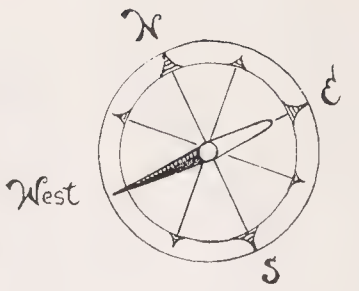
An earnest of future surprises came when I threw out a bit of sandwich to attract a possible insect or lizard, and before I could reenter the door a black shadow swept across my face, and a





Southward, the view is "pure medieval Italian, sheer Riviera," with a blue stone terrace and castellated rim, pink-tinted jardinières, cypresses and luxurious tropical growth. Beyond lies Arima Valley.





Westward — and just beyond the laboratory building is a towering flamboyant that spreads a conopy of scarlet bloom. Its main branches are alive with alien growths, an endless study for ecologists.

great turkey vulture glided low over the compound to see if my offering was aught but vegetable manna.

Hidden treasures spilled over from Verdant Vale were revealed when Jocelyn Crane and our East Indian caretaker Ramdial made a census of bearing fruit trees, and counted more than five hundred. These included scores of grafted oranges, besides tangerine and manderins, grapefruit, limes, breadfruit, mangos, soursops, tonka beans, pomaracks, two hundred cocoa trees, christophines, bananas, papayas, cocoanuts and nutmegs. The final list sounded like an excerpt from Swiss Family Robinson.

A pleasant antithesis occurred at my first visit with Ramdial, when he diffidently asked a favor. He said he knew I was a "mighty hunter" and perhaps had a tiger tooth which I did not need. At our next meeting I brought him a good sized canine and he proceeded to grind it up and feed it to his dog which had developed traits of cowardliness. Our talk was interrupted by the roar of a four-engined Pan-Am plane passing overhead. The two events offered a contrast whose significance need not be labored.

Having expended paragraphs on the environment and attractiveness of Simla we may briefly consider it from the practical side of a zoological station. Trinidad is served by two lines of steamships and by the Pan-American Airways. It seems hardly credible that thirteen hours will take us from our Zoological Park to the doors of Simla itself, overseas, a distance of twenty-three hundred and twenty miles.

From Simla, flights of twenty and seventy-five minutes, and two hours, transport us to Tobago, Caripito, Venezuela, and to British Guiana respectively. With a car, Arima is fifteen minutes away, Port-of-Spain an hour, while the north sea-coast is only eight miles, as the toucan flies, farther up our valley, all these places reached over excellent asphalt roads. In addition to the twenty-two acres belonging to the station there are, close at hand, the two large estates belonging to Dr. Wright and to Sir Norman Lamont, while we are fairly surrounded by government preserved forests. All of these are at our disposal for creative scientific research. The lower flatlands of Trinidad are richly productive of sugar, rice, cocoa, asphalt and oil, but much of these northern ranges have wisely been conserved, so that dense forests ensure non-erosion and a plentiful supply of rain. The animal, bird and insect life is abundant and little changed. Close to Simla a passing car inadvertently killed a six-foot Bushmaster, a Mongoose and a Silky Anteater. The voices of howling monkeys arouse nostalgic memories of Rancho Grande and British Guiana. Finally, let us not forget that within a few miles of Simla are breeding Hoatzins, Birds of Paradise and Frigatebirds, while the nest, eggs and young of the ghostly white Bellbird now calling within one hundred yards are wholly unknown.

Of the adequate household living conveni-

ences, from rooms to water supply, I have already written. Outdoors, at the outer perimeter of the compound, hidden by trellises and hedges are the well-built kitchen and store-rooms, servants' and caretaker's quarters and garage.

In the island are excellent named collections of native flora and fauna, especially those of Sir Norman Lamont, the Imperial College of Agriculture and the Victoria Institute. We find nothing but universal kindness and interest in our coming researches – from government officials, Trinidadians, British and from our own diplomats and American residents. Our chief worry in time to come is how, in some small measure, we may return these kindnesses.

It may be that the Department of Tropical Research is under the aegis of a kindly Providence, or it may be only luck. At any rate Simla (like Rancho Grande) came to our notice casually, by accident, by oblique hunch. This was on the part of Jocelyn Crane, who, like Kipling's soldiers, had gone ahead to make all ready, to survey Trinidad and Tobago in 1946 and 1948, to appraise conditions on these tropical islands for the establishment of a station.

We wanted a successor to Rancho Grande and all the preceding ones, afloat and ashore, but this time it must be a permanent tropical home. Simla was waiting, and Miss Crane herself does not know when she first realized that Arima Valley was not *A*, but *THE* place for a tropical Zoological Society station. And so it seems to qualify in every way – *dulce domum naturae.*

I do not feel altogether an alien in Trinidad, for my visits extend over more than four decades, beginning with March ninth, 1908. This was the eighth expedition of the Department of Tropical Research, outfitting at Port-of-Spain with the help of Eugene Andre. Our object was the wild life about the pitch lake of Guanoco, Venezuela, and we achieved it after an arduous trip on a small sloop. On this same expedition we spent a week in a valley west of Arima.[1] For a number of years, from 1916 to 1924, stopovers en route to Kartabo, British Guiana, gave time for lectures at the Victoria Institute. Another delegation from the Zoological Society was composed of Raymond Ditmars and William Bridges who in 1934 made a successful search in the island for living vampires and Bushmasters. They even visited Spring Hill and considered it a naturalist's paradise.[2]

The next department visit was the thirty-third expedition in 1936, on the yacht Hardi Biaou, when John Tee-Van, Jocelyn Crane and the rest of the party motored across the island, passing Arima.[3] Later in the same year Gloria Hollister visited Trinidad on expedition thirty-four, which included a trip to the oilbird cave on the Wright estate, four miles north of Simla.[4]

Numbering among past friends of many years such good Trinidadians as Eugene Andre, R. R. Mole, P. Lechmere Guppy and F. W. Urich, I feel a close and friendly affiliation with this delightful British island.

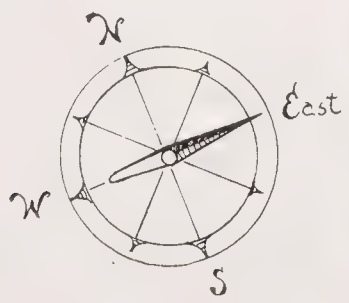
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1 Beebe; Our Search for a Wilderness, Henry Holt, 1910.

2 Ditmars & Bridges; Snake-hunters' Holiday, Appleton-Century, 1935.

3 Beebe; A West Indian Grand Tour, *Bull. N. Y. Zool. Soc.*, July, 1936.

4 Hollister; The Society's Expedition, *Bull. N. Y. Zool. Soc.*, Sept., 1936.

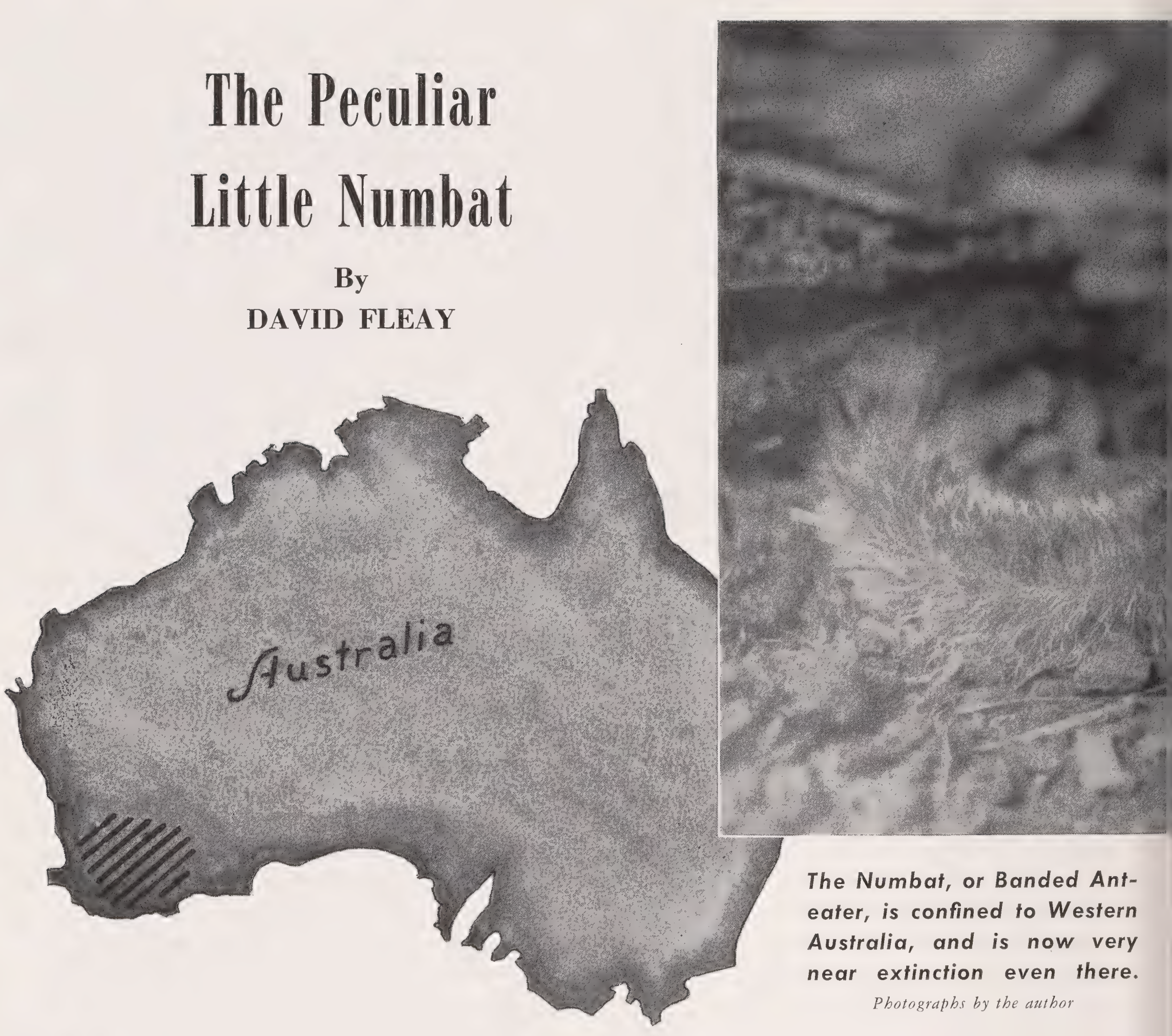




Looking east, across a corner of the terrace. Beyond the level, grassy compound at the top of the steps there is the beginning of the jungle and its gigantic trees, their limbs masked by hanging gardens.

The Peculiar Little Numbat

By
DAVID FLEAY



The Numbat, or Banded Ant-eater, is confined to Western Australia, and is now very near extinction even there.

Photographs by the author

ASK THE AVERAGE MAN in Australia to define a Wombat and his answer is ready enough, but a similar query on the not so differently named Numbat leaves him guessing. Actually, "Numbat" is the aborigines' term for a small, strikingly-colored, exquisitely dainty creature which probably less than .0001% of present day Australians have seen alive — or ever will — and which, sad to say, even now is passing into extinction away down in the southwest of Western Australia.

No bigger in size than a large brown rat, this banded anteater, as distinct from the egg-laying Spiny Anteater, has an origin of which the exactness is shrouded in mystery. It is a living but passing relic of the earth's very early furred animals. So different are the characters of *Myrmecobius fasciatus* from those of all other marsupials, that it requires a special family name in scientific literature, though it is possible that it is a far-back off-shoot of the more familiar group of Dasyure-like animals — "native cats" and their kin.

In color, the Numbat is one of the most outstanding of all native animals, and nothing short of a color photograph could really do it justice. Bright rust red is the general tint of the fore part of the body, while six or seven white bars cross transversely between the tail base and mid-back region, the fur between them being black. The animal thus has a pattern very similar to that of Tasmania's Marsupial Wolf. The individual



hairs of the body are comparatively coarse and longer ones with white tips give the animal a remarkable halo-like effect. A dark cheek stripe running to the ear and also a white one below it give the Numbat's face — otherwise so like that of the Brush-tailed Phascogale — its distinctive appearance. The tail is long and uniformly clothed with stiff hairs which may be rapidly bristled, forming a bold and handsome brush.

In the words of Professor Wood-Jones, the Numbat possesses the distinction of being so peculiar a creature that it cannot possibly be mistaken for any other species. As previously mentioned, its body is about the size of that of a brown rat, the male being decidedly larger than the female, but the figure of the animal differs from that of most small mammals in the remarkable breadth and flatness of the hinder part. The region of the loin, instead of being arched in typical mammalian fashion, is flattened much as it is in lizards. The comparatively thick and widely spaced forelegs, combined with the pointed face, seen in front view, are strongly reminiscent in miniature of the large ant-eating mammals of other countries. Another of the many primitive anatomical features of lovely little Myrmecobius is the absolute lack of any sign of a pouch. Its site is marked by specialized crimped hairs and there are four teats to which "joeys" hang while they are growing.

Though superficially squirrel-like, particularly in the light, airy way it scampers about with its fuzzed-out tail held erect or arched over its back, the Numbat really bears a closer resemblance to that fellow marsupial and fierce little raider of the gum trees, the Brush-tailed Phascogale. When hurrying over the ground this anteater bounds in a series of leaps, but in "slow motion" it indulges in a trotting action. Normally the tail is carried "at the trail" in a line with the body, but with a slight upward curve, and the hairs are not bristled. The arching and spectacular fuzzing of the tail over the back occur in moments of excitement and under conditions of emotional stress generally.

Less is known of the habits of the Numbat than of the majority of the pouched animals — which is saying a great deal — and it was with the idea of watching and recording its habits, and perhaps eventually obtaining a mate, that a young female was brought to the Healesville Sanctuary several years ago.

The many accounts of the delicate nature of Myrmecobius and its unfavorable reaction to conditions of captivity had caused a good deal of uncertainty about the transportation of one of these animals to Victoria by air, a distance of 2,000-odd miles from Perth. Hopes were not particularly bright when the little creature proved on arrival to be in a torpid, sluggish state, but I had seen many of the smaller marsupials, when cold, in this dormant, lizard-like state of lethargy, and was not hopelessly pessimistic of the outcome. On her first morning in Victoria, however, the Numbat was as lively as a cricket. She refused all food until the early afternoon, and then, from offerings embracing termites, several species of ants and their eggs, meal worms, beetles, grubs, earthworms, raw egg, bread and milk, honey and jam, she concentrated on the termites, and licked up every one in sight; or, more correctly, within "smell," for the olfactory



With its pink, sticky, four-inch tongue the Numbat licks up white ants, its favorite food.

sense is highly developed. The outstanding feature of the Numbat's meal time was the spectacle of her perfectly amazing pink tongue flickering with lightning rapidity deep into every crevice of termite-riddled wood, its tip shooting out of unexpected holes at all angles, inches away from the animal's snout. This cylindrical, extensible and sticky tongue is at least four inches long. Members of the smaller species of termites were gathered in and swallowed whole without chewing, but the larger white ants, particularly those of the soldier or fighter caste with the strong heads and formidable jaws, of such a robust species as *Calotermes insularis,* common in mountain ash timber, were subjected to rapid and audible mastication, the animal pausing meanwhile before gathering up further victims. Though the teeth of Myrmecobius are regarded as degenerate there are a very large number of them, 52 in all. That is twenty more than the total number bequeathed to man.

We found that the newly arrived Numbat's sluggishness and unhealthy appearance persisted, particularly in the mornings, for several days following her arrival. On November 30 she remained torpid all day, being quite incapable of feeding. Cold and stiff to handle, like a dormant lizard, she could scarcely struggle over to right herself when laid upon her back. However that cheerless twelve hours appeared to end our troubles. From the early morning of December 1 she did not look back. Termites and yet more termites, easily ten to twenty thousand of the smaller species daily, were demanded. Little Miss Numbat's capacity for these soft bodied, light-shunning insects appeared to be inexhaustible, and slowly but surely the old stumps and fallen logs of Badger Creek paddocks and surrounding bush



The diminutive size of the Numbat is well indicated by comparison with the hand of a keeper.

lands were reduced to chips and splinters. Old crumbling stumps were the usual bonanzas where despite many a red hot sting from bull dog ants, a spherical basement nest of termites would yield such a colony that the community warmth in the central region was astounding indeed.

In the timing of its feeding, this marsupial anteater impressed itself upon our notice by its very strangeness. In direct contradiction to the nocturnal habits of practically all marsupials, the Numbat frisks about and feeds freely all day and sleeps soundly at night! Never did we see it out after darkness had fallen. Our female had chosen a hollow log and in furnishing it with home comforts had been seen to carry in dead leaves and to strip dry grass, after much vigorous jerking and pulling with closed jaws, from an old tussock. Quite a comfortable bed was constructed in this chosen home. She never stirred from her boudoir after dusk.

Each morning, as soon as a fresh bucket of

white ant material was brought along, the Numbat (who in her eagerness usually jumped into the bucket) would devote undivided attention to the job in hand. Her powers of concentration on the minute, soft-bodied insects were unique. Sugar ants (*Camponotus nigriceps*), mixed with the rubble, occasionally clung to her legs, but without the slightest interruption to her tongue work, a lightning flick of each foot in turn would throw the intruders many feet away.

If the termites were deep down in hidden galleries in a piece of wood, the Numbat endeavored to solve her difficulties by opening her jaws, seizing the whole fragment and pulling it into a more favorable position. Her sturdy and prominent central foreclaws were used to good effect in scratching into rotten wood, and the long snout was also brought into play as a lever to force fragments of earth or wood apart. It was almost noticeable that, like the Spiny Anteater (*Tachyglossus*), the Numbat preferred termite-riddled wood so that the insects could be extracted cleanly from their galleries. Once they had fallen into the dust, rubble and general débris of a broken-up stump, the anteater was most diffident about collecting them, obviously disliking the accumulation of wood dust on her sticky tongue, and being unable to gather her victims in quantity. Evidently in Western Australia very rotten stumps extending under ground, old crumbling logs and soil-building termites are sought, for Myrmecobius is not strong enough to break apart anything but very decayed, flaky or earthy material. It is probable that the animals find little difficulty in scenting and scratching out colonies of such species as *Heterotermes ferox,* a termite found in southwestern Western Australia, as well as in South Australia, Victoria and New South Wales. This white ant is generally found in small colonies, living under stones and in galleries in the soil beneath them.



The forefeet of the animal are quite strong and are useful in scratching into decaying stumps.

In spite of the provision of every species of true ant and other insects procurable in the Healesville district, it appeared quite definite from the captive animal's behavior that the Numbat is almost wholly a "white ant" eater. In fact marsupial or banded termite eater might have been far more apt a name than the unspecific one of banded "anteater." Admittedly our animal did devour odd ant eggs and some ant larvae and cocoon-enclosed pupae, but only when hungry and she always passed them by in favor of a straight termite diet.

The vigor and rapidity of the dainty creature's movements in working for her food was amazing. She became most annoyed if she was touched while working on a good "prospect," and uttered low-toned, churring noises of protest that could be likened to sounds of heavy breathing. If she was gently pushed away from her food she usually retaliated by pushing back or leaning hard against one's hand, the whole time feeding persistently.

Once while scampering about, the Numbat was heard to give a rapid staccato and very phascogale-like series of "tut tut tut tuts," evidently representing calls or conversation in the Myrmecobius tongue.

It was noted on a number of occasions that following a hearty meal, when her abdomen was quite hard and bulging with its solidly packed termite content, the Numbat scampered to a broad log, upon which she was in the habit of resting, and stretched herself with long fore limbs extended, tail straight out from the body and jaws yawning widely. The truly amazing feature of the whole languid attitude, adopted in full sunlight, lay in the outward and downward extension in a graceful arc of the whole four inches of pink ribbon-like tongue.

The Numbat is not a burrow-making creature, and contrary to general belief it is quite a clever climber. Our specimen showed that she would experience little trouble, if need be, in searching for termites in crumbling stumps several feet above ground.

The disregard of danger in the presence of food, so typical of a number of marsupials, is pronounced in the Numbat. If the little animal at Healesville was picked up, she made no attempt to struggle and had not the faintest inclination or idea of how to bite. Naturally everyone at the Badger Creek Sanctuary became most attached to her. Her sprightliness, beauty and friendliness won all hearts, and thousands of visitors, seeing a Numbat for the first time, were fascinated by the lively little creature. She had adapted herself to the new life as if born to it, and no return of her sluggishness and early sickness occurred.

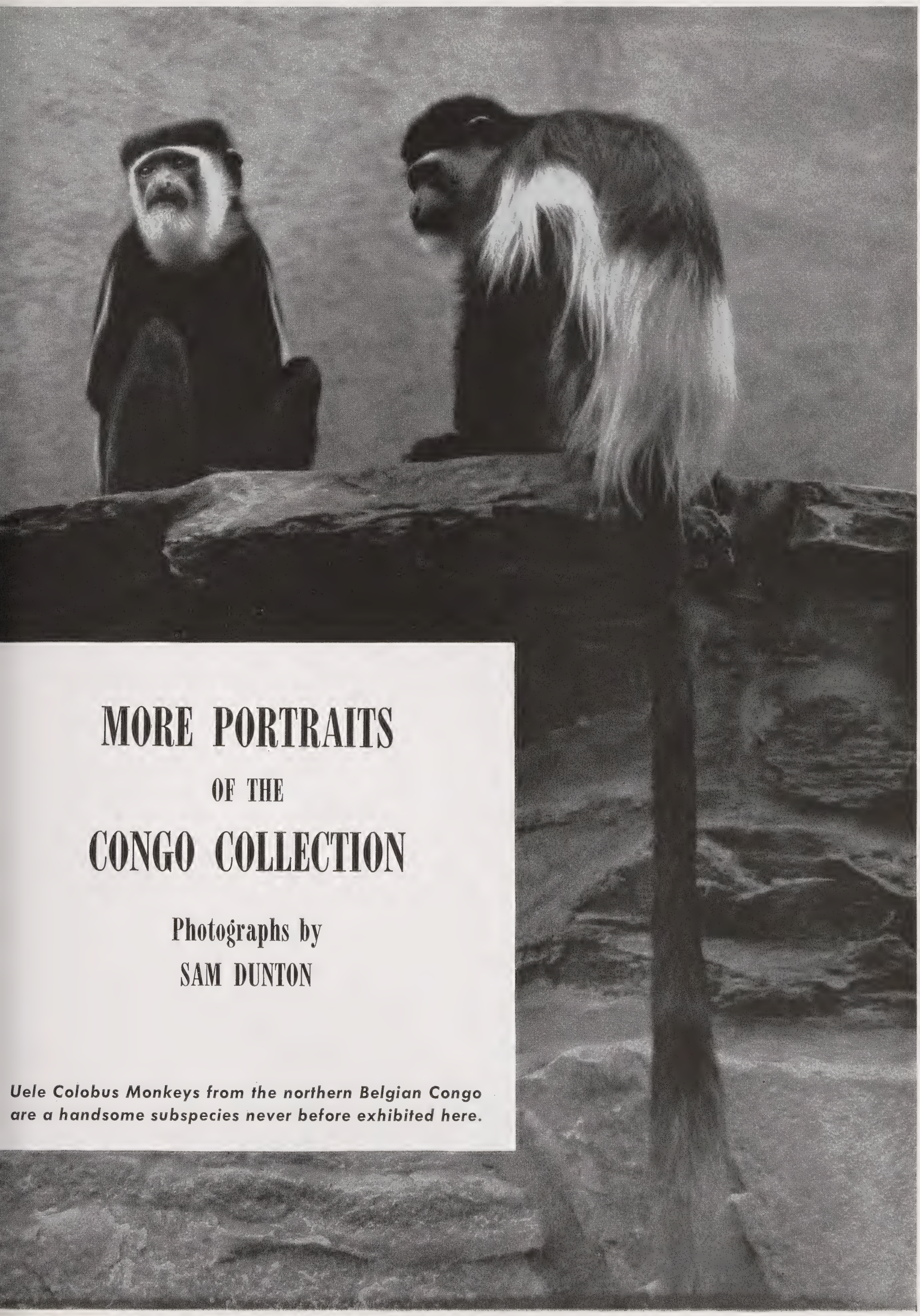
However, in February, 1942, tragedy brought the Numbat's chapter to a sad conclusion. With startling suddenness early that month the little animal collapsed and died within the space of several hours. She had been at the Sanctuary for a little more than two months. Perhaps I had not obtained quite enough termites, though goodness knows millions were procured, and we had run ourselves "poor" in the continual hunt. A more likely explanation of the Numbat's untimely death lay in the probability of a bite from a Redback or Katipo Spider (*Latrodectus hasseltii*).

From all accounts of the Banded Anteater in its West Australian habitat, it relies entirely on hollow logs as a refuge, and consequently bush fires wreak havoc with it. Formerly it had a fairly wide distribution, extending from the South Australian Murray lands, where it still existed 38 years ago, and the west of Victoria, right across to Western Australia; but unfortunately, the South Australian animal (a distinct species) has gone for ever, leaving only the southwestern corner of the continent as the last home of Myrmecobius. It was most obvious to me during a recent visit to the Lofty Ranges in South Australia that the semi-buried and teeming termitaria must have provided an abundance of suitable food for the South Australian Numbat in its heyday.

The survival of an animal so specialized, so foolishly trusting and in some respects so degenerate, into the present century could only have been possible in such an isolated place as Australia; but the white man with his burning off and his dog and cat is unconsciously but rapidly spelling its doom. Only properly designed, wire-netted and well-guarded reserves in the southwest of Australia, and the liquidation by poisoning of animal marauders, can halt, or even delay, the rapid passing of the remnant into the vale of no return.

MORE PORTRAITS
OF THE
CONGO COLLECTION

Photographs by
SAM DUNTON



Uele Colobus Monkeys from the northern Belgian Congo are a handsome subspecies never before exhibited here.



ckson's Flying Squirrel appears never to have been hibited alive until Charles Cordier brought this one us from the Belgian Congo. It has various anatomi- peculiarities, including scales on the undersurface the base of the tail. Very little is known about zoological relationships and habits in captivity.

This is the first specimen of the African Brush-tailed Porcupine we have exhibited, although the Indonesian form has been seen here. Its name comes from the modification of the quills at the end of its tail into thin, flat strips, very much like strips of paper. It is a ground-living, forest-dwelling, rather small animal.





Schouteden's Crested Guineafowl is a subspecies that we have never before exhibited, and which probably has not been shown alive anywhere else, although the typical form is sometimes seen in zoological gardens. Most guineafowl have bony plates on the head, but this is one of the crested types and has a thick "topknot" of black and curly feathers. It is a forest bird, feeding on grain and fruits.

The Uele Crested Guineafowl is another subspecies we have never before exhibited. Its crest is formed by stiff black feathers that are straight and almost hair-like. It appears to be fairly common in the equatorial forest, for many specimens were brought to the Society expedition's base camp by natives who had captured them in snares—an indication that many others end up in village stew-pots.



The Social Life of Fishes



By JAMES W. ATZ

"Will you walk a little faster?" said a whiting to a snail,
"There's a porpoise close behind us, and he's treading on my tail.
"See how eagerly the lobsters and the turtles all advance!
"They are waiting on the shingle – will you come and join the dance?"

LEWIS CARROLL notwithstanding, lobsters do not perform quadrilles at the seashore, and even if they did, any Whiting that put in an appearance would be looking for a lobster dinner rather than entertainment. But fishes *do* have a well developed social life of their own, some of their gatherings transcending any square dance in extent and importance. Scientists are only beginning to understand the complicated reactions of fish to fish; the more they learn, the more we can wonder at the diversity and complexity of the social life of fishes.

In a public aquarium, where many species are kept together in both natural and artificial groupings, a kaleidoscopic variety of interactions among fishes goes on continuously. Aquariums are accordingly one of the best places to study many phases of piscine social behavior. At the New York Aquarium some very important pioneering and basic research in this field has been accomplished, especially on schooling and other aggregating activity.

Anyone who has ever watched a school of fish cannot help being impressed when he sees hundreds or thousands of similar individuals, all swimming in the same direction and at the same speed, each one uniformly equidistant from its closest neighbors. So compactly arranged and perfectly synchronized are the fish that the whole school seems to move about as a single organism or unit: swerving to avoid some obstruction, slowing down or speeding up, turning, changing shape to pass through some narrow opening, even splitting apart in order to get around a log or stone, only to reunite without the slightest hesitation as soon as the obstacle is passed. Here is an army without officers or commands, with no definite ranks or formations and yet showing precision and controlled flexibility that a West Pointer might envy. Here is regimentation that should satisfy the most adamant dictator!

Fascinating as the fish school is, it was not until 1926 that the first analysis of what keeps schooling fish together was made. In that year the crew of the Aquarium's well-boat seined several hundred members of a school of Chub Mackerel on one of its collecting trips to the Lower Bay. These were placed in a large, oval floor-pool in the building at the Battery, where they soon formed what is called a *mill,* that is, a school in which all the fish swim in more or less concentric circles, 'round and 'round, the school itself remaining stationary. Dr. Albert Eide Parr studied this milling school very carefully and decided that a comparatively very simple set of reactions could explain the apparently complicated and mysterious behavior.[1] All that had to be assumed was simply that whenever two mackerel saw each other, they came together until they were some small but definite distance apart and that they then swam parallel to each other, thus maintaining this distance. The formation of a school, Dr. Parr showed, would then automatically follow. Milling was mainly

the result of a school being partially turned back on itself by the wall of the tank so that the leaders could see members of their own group, swimming in the opposite direction, which they then attempted to follow, thus completing a nearly circular path.

According to this view, if mackerel cannot see they will not school. By covering the eyes of a few fish with vaseline mixed with lampblack, Dr. Parr obtained striking proof of this part of his theory. So long as they could not see, the mackerel swam aimlessly about the tank, often right through the school without paying the slightest attention to the other fish, even though they sometimes collided with them. As soon as the covering wore off their eyes, however, they immediately rejoined the school, again becoming "one of the crowd."

Since Dr. Parr performed his pioneering experiments, numerous other investigators have confirmed and extended his observations.[2] Fish that were blinded in one eye only schooled when their seeing side was turned towards their companions. Fish that were kept on either side of a glass partition, or in two adjacent aquaria completely separated from each other in every respect save sight, schooled with one another by swimming side by side up and down the glass. When a mirror was put into their tank, fish attempted to school with their own images. Practically instantaneous flash-

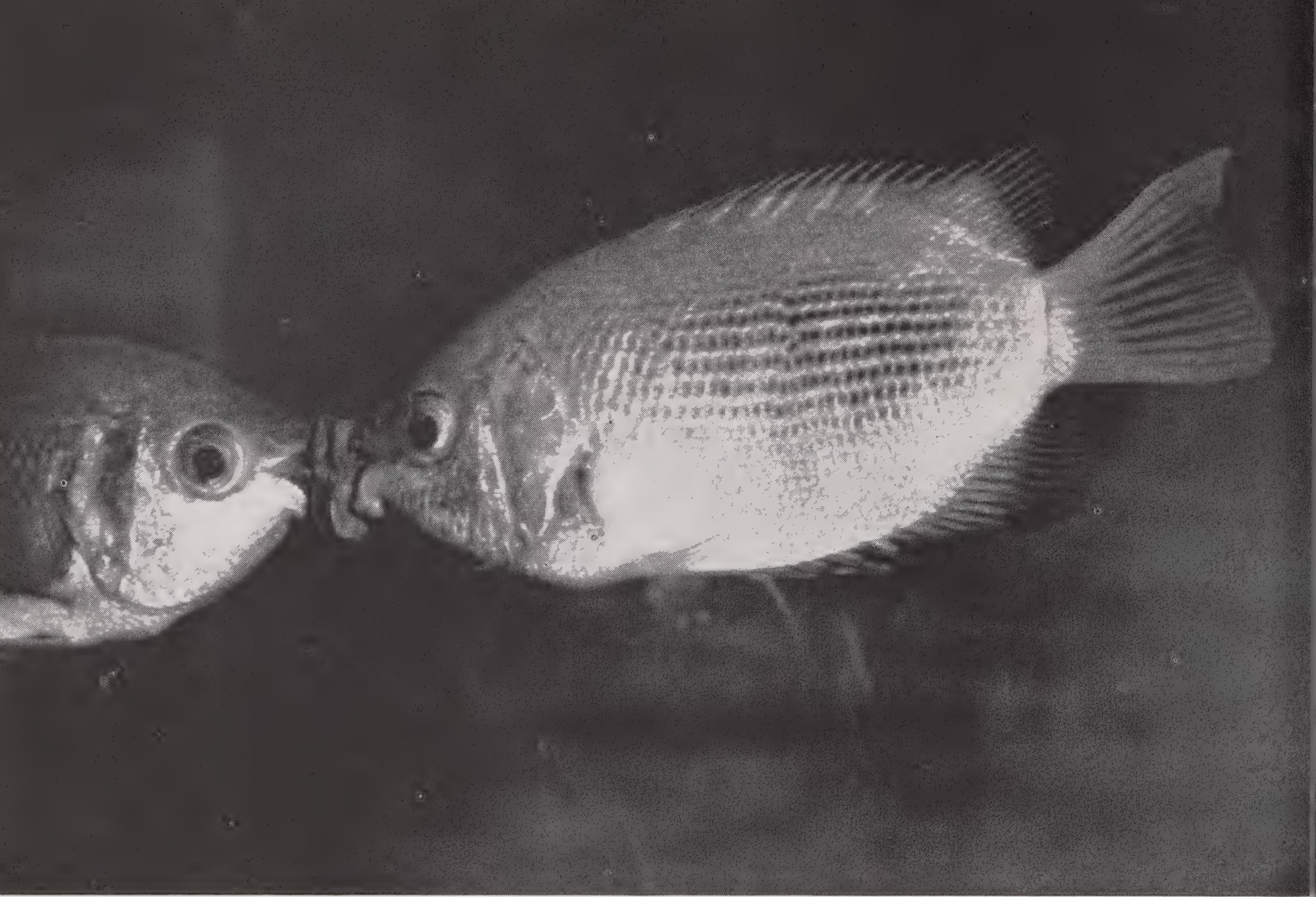


From Gudger, after Field and Stream

One of the most remarkable examples of social life in fishes ever photographed is this aggregation of trout in the Brule River, Minnesota. No definite explanation for such a "military" alignment in ranks has ever been brought forward, although Dr. E. W. Gudger has discussed the phenomenon in "Zoologica."

bulb photographs, taken of mackerel that had been in total darkness, revealed that their school was dispersed.

These rather ingenious experiments only answered one of the scores of questions about fish schools, however. For instance, scientists still do not know exactly how one fish recognizes another



Kissing Gouramis, photographed in the act that gives them their name. The "kiss" may last as long as 25 minutes. Is it courtship, mouthcleaning or aggression? No one knows.

as the right kind of object with which to school, although they have made progress in determining the factors involved in the recognition of fish by fish.[3] Normal mackerel will school with an individual painted the most outlandish colors, but will not do so with a freshly killed specimen moved about by wires, or with a blindfolded one—which swims more slowly and less rhythmically than a normal fish.[4] Evidently movement is of importance but color is not. Just what the essential points of recognition and reference are, or just why certain species of fish form schools while others do not, and what benefit they derive from the habit—these and many other questions remain a challenge to the student of fish behavior.

Mackerel, herring and the like school continuously, except on dark nights; some other species of fishes only school or come together to form aggregations under special conditions. The freshwater black basses and sunfishes are some of these. Once again, as with the schooling mackerel, observation of what these fishes did in the New York Aquarium's tanks led to the discovery of basic information on their behavior and mode of life.

In the old Aquarium, most of the freshwater circulations were fed directly from the city's mains. Each winter in late November or early December it was noticed that the sunfishes and black basses would form tight aggregations in their tanks, remaining quiescent in variously shaped groups, very close to one another, facing more or less in the same direction. When frightened, they dispersed, but within an hour or so the same kind of grouping was formed again. Quite obviously temperature had something to do with this performance, since it occurred only when the water dropped to about 40° F. and disappeared with the warmth of spring. Drs. Charles M. Breder, Jr., and Ross F. Nigrelli of the Aquarium's staff subjected these aggregations to careful experimental analyses and found that not only temperature, but also light, water current and carbon dioxide definitely influenced aggregating be-

havior.[5] The information that they obtained proved helpful to fish culturists and sportsmen in explaining what happens to bass and sunfish in winter and under various adverse conditions.

Even fishes that apparently exhibit little or no response to companions have been shown to possess some sort of social sensibility. For years people watched goldfish swimming about, alone or in groups, in bowls, tanks or ponds, and no one ever suspected that they were more than casually aware of one another – except in competition for food or mates. But then some zoologists compared the rate of oxygen consumption and amount of activity of solitary goldfish to those in groups of two or more and found that when alone, a goldfish travels faster and farther, thus consuming more oxygen, than when it has companionship. Moreover, Drs. Breder and Nigrelli found that the pattern of movement is different also; a solitary fish keeps close to the sides and bottom of its container much more than does one with other goldfish.[6] Although we have absolutely no reason at all to believe that goldfish suffer from loneliness as human beings do, they certainly appear to experience some lack in their environment that can be satisfied by the presence of another goldfish.

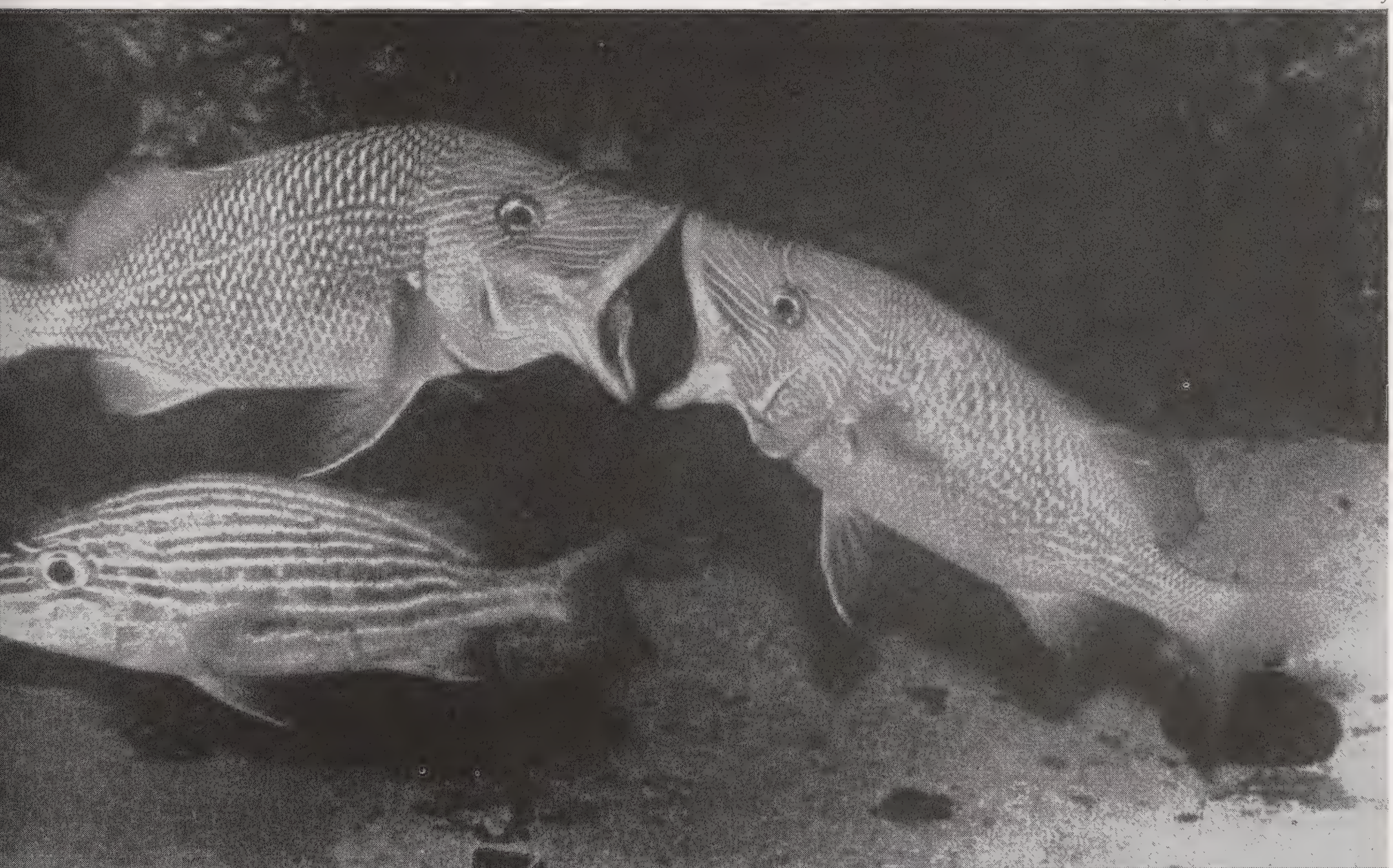
There's more to life in a goldfish bowl than meets the eye, proverbially or otherwise!

Aquarists are nearly as much concerned with what might be called the anti-social, rather than the social, behavior of their charges. Bullies, tyrants, murderers and cannibals all appear to have their counterparts among fishes, and tankmen must be constantly on the watch to detect incipient trouble and to isolate aggressors or remove potential victims. Some species are characteristically aggressive, including most of those that naturally feed on other fishes, of course. These can only be safely maintained by themselves or with specimens too large to be molested.

The blood-thirsty piranhas of South American rivers and lakes are so savage that they must be kept completely alone, even separated from their own kind. Although they may not attack each other immediately when in captivity, sooner or later they turn on some member of the group and chop him to pieces with their trap-like teeth and jaws.[7] They seem to realize this ever-present danger and when placed together in a tank, are sometimes quite obviously terrified of one another, hiding or trying frantically to escape through the glass walls of the aquarium. At other times they will swim quietly and cautiously about, keeping far apart from their companions and trying to maneuver so that no other fish gets behind them and out of sight. "When food appears, the others are almost forgotten and the whole school flashes savagely at the prey, chopping off pieces and

Yellow Grunts often engage in this curious activity, approaching each other with open mouths, touching and backing off, again and again. Inside, the mouth is bright vermilion.

Copyright by Paul Kearney



swallowing in a swirl of darting fishes. It is probably at this time above all others that the hungry fishes, in a cloud of blood and juices from the food, most frequently bite each other, probably more by accident than for other reasons. But a member of the school so unlucky as to be seriously bitten by another is attacked by the rest with gusto and he soon disappears."[8] Piranhas in the wild frequently show regenerated semicircles on their fins, where they have been bitten by another piranha, so presumably cannibalism is a common occurrence among them in nature also. Here is a fish that is literally its own worst enemy!

Individual, as well as specific, differences in aggressiveness also exist. It is the exceptional tank, even among those with only a single kind of fish, that does not contain one or two individuals having things pretty much their own way. In certain species, the popular Swordtail of home aquaria for example, the top fish is technically known as a *despot,* and well named he is, for he dominates by force and fear and brooks no disregard of his authority. All offenders are "punished" vigorously with sharp nips, and subordinates are sometimes harried so much that the aquarist must either rescue them or remove their persecutor to save their lives. The social order that a despot predominates over is called a *hierarchy*. In this far from altruistic society, the despot, which is usually a large male, has the prerogative of nipping all the other fish without reprisal, and with this goes his choice of food, swimming space and mates. The number two fish, as he might be designated, nips all but the despot; the number three fish, all but the despot and the number two fish; and so on right down to the lowest member who can nip no other fish and must submit to all. This is a *straight-line hierarchy*. Among less aggressive species like platyfish and barbs, social position is not a regular, step by step affair, but is more complicated since several individuals can occupy essentially the same rank.

The position of a despot is not inviolate, however, no matter how harsh his rule. "Every fish . . . seems to know every other as an individual, and every subordinate appears to be awaiting an opportunity to revolt against the despot. An attack upon a despot frequently leads to a complete revolution within the group, each individual taking up a new position in the order."[9]

When a new fish is put into a tank, it almost invariably starts at the bottom of the social hierarchy. Resident individuals that are considerably smaller and less vigorous will dominate it until it becomes accustomed to its unfamiliar surroundings. Then it may advance part way up the social scale, but seldom does it vanquish the despot, the advantage of prior residence being too great to overcome. Although students of fish behavior have only lately analyzed the superiority that prior residence in a tank confers, this has long been used by aquarists as a means of keeping aggressive and submissive fishes together without danger.[10] The smaller or less domineering individual is put into the tank a few days or a week before the other. Usually this ruse suffices to keep the potential aggressor in check. If it shows signs of becoming too "bossy," removal from the tank for a day or so is generally sufficient to put it back in its proper subordinate social position.

Fish fights usually do not last long; one of the combatants soon turns tail and flees. The reason why quarrels often end fatally in captivity is that the vanquished cannot escape from the victor, who ceaselessly pursues him or corners him and forces further battle. A few fishes will stand their ground, however, and "slug it out" for hours until exhaustion or injuries make further combat impossible. Two such species have been utilized by man for his amusement. The famous Siamese Fighting Fish or Betta has been employed in sporting contests for several centuries and has been selectively bred for fighting qualities by the Siamese for the past hundred years. Less well known is the tiny freshwater Halfbeak that is also specially bred in Thailand for public exhibitions. Pugnacious Bettas fight by biting, tearing one another's fins and scales, while Halfbeak males do combat by grasping each other with their sword-like jaws, wrestling back and forth, breaking their holds and regaining new ones.[11]

Aggressiveness in fishes is often associated with defense of territory. Members of some species take over a clump of aquatic plants, a stone or an empty sea shell and its environs, a bit of coral reef or the corner of a tank, and make it their own, defending it vigilantly against other fishes, especially those of their own kind. Each fish patrols its territory like a policeman on his beat and seldom strays far away. Often it will move sand,



Smallmouth Black Bass form close aggregations in winter-time. The particular shape assumed by this grouping in the old Aquarium is caused by the direction of the water flow.

mud, plants and small stones — even the siphon tube of its aquarium — and rearrange its chosen home to suit itself.[12] So strong in the Beau Gregory and other member of the family of small, brightly colored marine fishes to which it belongs, is this home-owning urge, that when a number of individuals are placed together in a tank they will kill each other off until the population has been reduced to a point where every fish can have a territory of its own. Then and only then does fratricide cease.

Knowledge of the causes of aggressiveness in fishes is of practical importance in other places than public aquariums. When large numbers of Smallmouth Black Bass in rearing ponds in Ohio were being lost through cannibalism, a painstaking study of the reason for this undesirable behavior was made. Competition for food and the presence of aquatic vegetation (into which the larger, naturally anti-social individuals could retreat, sallying forth to catch the smaller ones) were found to be two critical environmental factors. Removing all the plants from a pond practically forced every bass, large or small, to become part of a single aggregation, and with adequate mass feeding of this motley group, cannibalism almost completely disappeared.[13]

The loss of the impulse to aggregate and the assumption of a solitary, piscivorous mode of life occurs naturally in bass as they grow up. Sometimes, however, fishes that are normally peaceful throughout their lives suddenly become domineering trouble-makers and occasionally raging demons. For instance, there was the case described by Curator-Aquarist Coates, of the male Ruby Jewelfish at the Aquarium, who was at times a model husband and father, assiduously caring for eggs and young with the constant help of his mate, as is usual in this species. When moved from a reserve aquarium behind the scenes into an exhibition tank, however, he killed three successive mates — even though he had previously successfully raised families with each of them a short time before being placed with them on public view.[14]

Another instance concerns the habitually mild-mannered Zebra Danio. Dr. Breder tried to train several pairs to school together continuously by placing two iron electrodes at opposite corners of their aquarium and administering mild electric shocks to them whenever they swam far apart. Instead of learning to school, however, they soon began to rush together, vehemently biting one another, each time a shock was given.[15] Psychologists call similar behavior in higher animals *displaced aggression,* in which animals react to a disagreeable stimulus or situation by attacking the most readily attackable object near them at the time — which usually is one of their companions.

It is apparent from all these studies and observations that fishes do not just swim around, leading the simple, aimless lives that have been popularly ascribed to them — and believed in by some scientists, too. We can only mention a few of the many other striking examples, such as Dr. Arthur Shlaifer's demonstration at the Aquarium that Tarpon *imitate* one another in their regular dashes to the surface for a mouthful of air.[16] Unexplained is the weird immobilizing effect of the predatory Zebra Fish on small killifish, in which the prospective prey, instead of fleeing as it ordinarily would at the approach of a large fish, remains as if transfixed, quivering violently, until with a sudden gulp the Zebra Fish swallows it.[17] Equally mysterious is the way Puffers "gang up" on a crab with all the artful teamwork and savage skill of a pack of wolves, feinting and harassing from all sides, until one fish is able to avoid the crab's claws and deliver the telling bite to its vital nerve center between its eyes, paralyzing it and ending the one-sided battle.[18]

We do not even understand seemingly simple things like the Kissing Gourami's kiss[19] or the Yellow Grunt's open-mouthed display.[20]

Students of animal behavior are really just beginning to find out what they do *not* know about the social life of fishes. From now on we may expect more and more amazing discoveries and astonishing facts to come out of their work. But the enthusiasm and wonder that arise from these discoveries must not be allowed to overbalance reason and perspective. It is extremely easy to fall a victim of the fallacy of *anthropomorphism,* that is, to ascribe human attributes, emotions and capacities to lower animals.[21] We have spoken of regimentation in schooling fishes, of loneliness in goldfish, of homes for Beau Gregories, and of piscine tyranny, cannibalism and uxoricide. The significance of any of these items, however, is entirely different for fish from what it is for man. In fact, the most legitimate excuse for using the same word in connection with both fish and man is that to employ the technical jargon of behaviorists would necessitate a small dictionary of definitions as well as a rather extensive background in psychology. What we need to remember is that fishes live in a world physically and psychologically utterly different from our own, with no true language, no word-thoughts or abstractions and no culture. All of which makes the things they do not any the less marvelous, but only the more strange.

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Dean of all the Birds of Paradise in captivity is this 20-year-old, still active Twelve-wired.

Not Nine Lives —

But Long Ones

By LEE S. CRANDALL



"Old Shep" was a Kea with a strong personality—and he also lived to a record age of 28.

NOTES on the longevity of animals in captivity are of especial interest, as offering the best available information on potential life spans. They are a basis for pride, too, as evidence that the conditions under which the animals were kept must have approached the optimum.

In August, 1929, we received a pair of Twelve-wired Birds of Paradise — or, at least, two birds that looked like a pair, for one was in full male plumage, the other in the sober dress of the female. Five years later this supposed female amazed us by producing enough black feathers to indicate its true sex; in two years more the male plumage was complete. These phenomena were of sufficient importance to be reported in *Zoologica*. Incidentally, the same bird was the

subject of another paper in *Zoologica,* concerning the disposition in display of the twelve curious "wires."

On August 2, 1949, this bird passed the twenty-year mark, establishing what we believe to be the longest record for any Bird of Paradise in captivity. The best official report that we can find is 12 years, 1 month and 3 days, for a Greater Bird of Paradise in London Zoo, recorded by Major S. S. Flower. In 1920 Dr. Portielje, Assistant Director of the Amsterdam Zoological Garden, told me that a Lesser Bird of Paradise had lived in that institution for approximately 17 years. This record has so far not been formally reported but during a recent visit Dr. Portielje verbally confirmed it.

From such scanty data, it is obvious that potential longevities of Birds of Paradise are not well known. Nevertheless we reaffirm our pride and hope that our old Twelve-wired, noticeably ancient but still active, will add further years to his present proud position as the oldest Bird of Paradise so far recorded.

Parrots live longer in captivity than most other birds, although the popularly reputed 100 years probably has never been achieved. Certainly not by the Kea, hawk-billed native of New Zealand. Accused, justly or not, of the cardinal crime of sheep-killing, the Kea has been persecuted until it is now one of the world's rarest parrots.

On November 5, 1920, "Old Shep" was brought to the Zoological Park by the late Ellis Joseph. Previous Keas had shown unmistakable dislike for indoor quarters, so Old Shep was installed in a spacious cage just outside the Large Bird House. Here he quickly became a favorite, spending his days dancing and begging and his nights in a large hollow log laid on the floor.

Two amusing tales stand out in the long career of Old Shep. Since the Kea is reputed to be a sheep-killer, it is sometimes suggested that raw meat should form part of its diet in captivity. This point was thoroughly discussed and a decision made that since meat is not a natural food of parrots, it should be eliminated. Nearly ten years passed, until one morning as I was admiring Old Shep's beautiful plumage, the keeper arrived with a pan of food. Old Shep fell to with evident enthusiasm, choosing first some long, limp bits which proved to be strips of raw meat. Prompt investigation soon revealed that the keeper, who was quite hard of hearing, had entirely misunderstood his instructions and had been feeding meat to the Kea every day for all those years! That was the end of it, of course; Old Shep was put on a meatless diet – but with no change in his beautiful condition.

In 1940 Old Shep gained national fame by acquiring a wife with whom he lived on terms of armed neutrality. The stranger at once appropriated the sleeping log, ejecting the rightful owner and forcing him to sleep in a corner of the cage. This difficulty was adjusted by the introduction of a second log, placed alongside the first. In these "twin beds" the unhappy couple spent the nights of the following year, each bird in its own log. At the end of that time nature found a solution through the medium of an ulcerated liver – which may have been the cause of the new bird's unpleasant disposition. It died, and in the routine examination we discovered that Old Shep's "bride" was a small, dull-colored male. In the normal course of things such a bird could never have been a bully. The liver trouble, we think, furnished the internal drive that made "Phyllis," as we called Old Shep's presumed mate, lead him such a dog's life.

Old Shep died peacefully on July 18, 1949. His 28 years, 7 months and 28 days with us far exceed the best previously reported 14 years, 5 months and 10 days. He also established the facts that a Kea is a bird of strong and pleasant personality and that he can take his meat – or do without!

News from the Conservation Foundation

Report to the President on An Important Meeting

(Editor's Note: *This is a letter from Robert G. Snider, Research Director of The Conservation Foundation, to Mr. Osborn reporting on the United Nations Scientific Conference on the Conservation and Utilization of Resources which was held at Lake Success the last half of August and the first half of September. Mr. Osborn, as the representative of the United Nations Educational, Scientific and Cultural Organization, was a member of the Preparatory Committee for UNSCCUR. Mr. Snider served as his alternate, representing UNESCO and the Foundation on the Preparatory Committee, and was a member of the Program Committee, actively concerned with the management of the conference and some of the field trips offered to the delegates. The letter is addressed to Mr. Osborn at Moran, Wyoming, where he was spending some time at the Jackson Hole Wildlife Park in mid-September.*)

Dear Fair:

I thought perhaps you might like to know something about the outcome of the UNSCCUR meeting with which we have both been involved for such a long time. You will recall that the tally for countries represented at the meeting was 51 and that there were about 300 representatives of foreign countries and something over 400 Americans who attended the three weeks' session at Lake Success. Most of these had arrived and had participated in the six resource section meetings – land, forests, water, wildlife and fish, fuels and energy, and minerals – by the time you had to leave just shortly before the end of the formal conference.

One thing that impressed all of us who were participating in the management of the meeting was that delegates from both this country and abroad actually stayed through the whole three weeks in many more instances than we had any reason to expect. We had been afraid, as you know, that the length of the session and its diversity, as well as the season of the year, would drive people away. Some, of course, had plans for discussing specific problems with American colleagues who had been unable to attend, but I feel that such things as the behavior of an eminent American agricultural scientist who said on the first day that he was going to stay for three or four days and then probably leave unless it was worthwhile – said in a Doubting Thomas manner – is a fair measure of the merit of the meeting. He actually stayed for two and one-half weeks and then left only because he had a prior speaking engagement.

It's somewhat difficult at this stage of the game to really assess the value of the conference. Its long-range objective of cross-fertilizing the minds of the several specialized groups of scientists who were the participants is something we can judge only by results which may appear in one to twenty years in the form of resource development programs throughout the world. But I think that the chances are pretty good. For instance, national barriers were broken down in the atmosphere which was generated—barriers which could never have been broken down in the participants' home countries. During part of the conference and on the post-conference field trip, I watched and listened to five delegates from as many Middle Eastern countries, whose nations are but recently on even formal speaking terms, discuss technical problems of water development and exchange information which may have significant bearing on prospective advancement of each country.

The whole tenor of the conference differed markedly from the usual United Nations meeting. Actually the participants came there as individuals, not as representatives of their countries.

The conference passed no resolutions and debated no political issues. It did provide free and open discussion of technical resource conservation problems. A measure of its difference, as well as its unusualness, is perhaps best suggested by the comment of one of the U.N. Secretariat at the reception given by Secretary-General Trygvie Lie on the last day of the conference. As participants were exchanging addresses and handshakes and warm smiles, she came up to a group of us and said, "I am terribly sorry that this conference is over. It is ever so much more enjoyable to work with the scientists than with the politicians."

No country failed to contribute useful and important information in the various meetings and no country failed to take away new thoughts and new points of view of high importance in their present and prospective resources development programs. This was due, I think, partly to the fact that instead of having to listen to formal papers being read at the rate of one each half hour, the emphasis was placed on discussion of the papers. This gave nations who had real problems an opportunity to talk with authors or their representatives and to get a discussion going which would reveal how other nations met these problems. We kept statistics on one meeting in which we had actually been afraid there would be very little discussion. In less than two hours of discussion, which followed about one-half hour of presenting the important factors of seven previously prepared papers, twenty-five different individuals representing fourteen different countries spoke a total of forty-five different times. In addition to getting questions answered, each participant was able to identify the individuals who knew the subject thoroughly and were able to go and talk at more length with them later. The fact that the meeting was held at Lake Success with its admirable facilities for getting off in a corner of the convenient delegates' lounge was actually an asset, although we had originally been quite concerned, as you will remember, about having to move people almost twenty-five miles from Manhattan daily. I understand that the summaries of these discussions together with the complete set of formal papers will be published in the relatively near future by the United Nations. These will certainly serve as an invaluable guide.

One last comment on the intellectual side of the meeting — your keynote made a real impression on the group, and although population problems, as such, were not formally included in the program as a separate topic, I found, much to my delight, that the rapid increase of population which you emphasized, together with its consequences, was uppermost in everyone's mind and was a controlling factor in each discussion of regional development.

I think there were three occasions in the course of the entire conference which stood out notably and stimulated not only a real sense of appreciation by the participants for the hospitality offered but also did more than anything else to weld the entire group into something pretty close to a single unit. The starter on this was the Zoo Party on August 27. I have seen a number of Zoo Parties myself, including our last one with all of the Belgian Congo acquisitions; however, I don't believe I have ever seen a more enthusiastic response to the wonders of the Zoo than was shown by this group of some 250 people. As you know, they felt the warmth of your welcome. In addition they had an opportunity to really see the high level of scientific investigation which is being conducted, and this registered on them. It was something they did not expect at a Zoo, as a matter of fact, and as for the Zoo itself — well, it can stand on its own feet, and certainly did that day. For weeks afterward I heard talk about what a marvelous party it was. It was the first real chance for the group to get off on a social occasion. They ate it all up — including a very marvelous lunch!

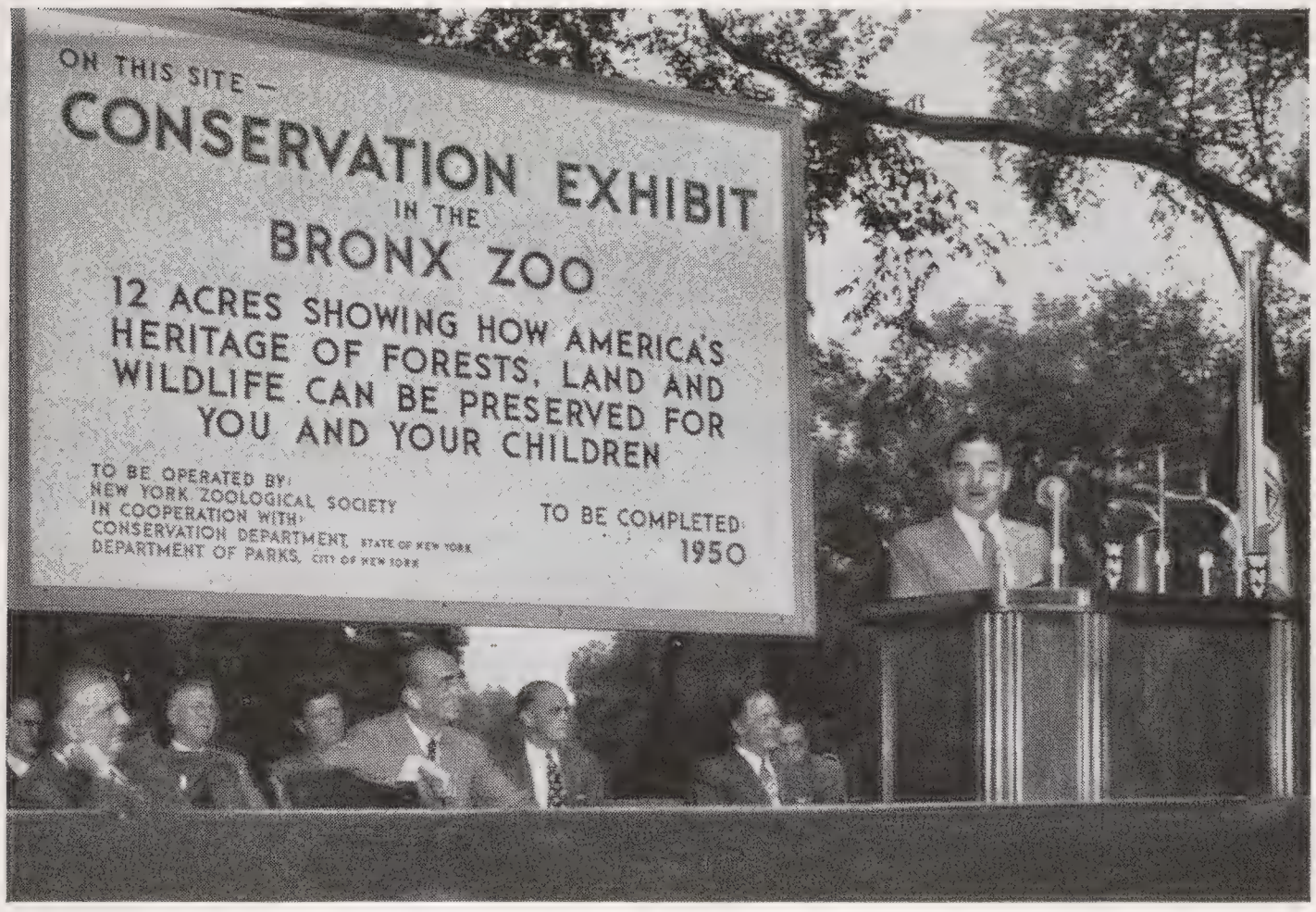
The second occasion was a delightful lunch given to all participants by the American Citizens Committee for UNSCCUR. Your co-members of this committee, Clarence Francis and Thomas J. Watson, I know felt the real gratitude of the entire group for such hospitality. Similar appreciation was expressed for the field trips in land conservation and forest conservation arranged by our trustees Kent Leavitt and Randolph Pack. Among the lesser impressions made on the members of the conference was the thirty-minute police escorted trip from Lake Success to the Hotel Pierre. It was practically like one of those old time, speeded up movies.

The final touch was a trip as guests of the U. S. State Department for something over 150

of the foreign participants – from 41 nations – through Pittsburgh and Columbus, Ohio; then through northern Alabama and Tennessee to look at various developments under the Tennessee Valley Authority; and, finally a stop in Washington to see various fish and wildlife conservation demonstrations, forest and agricultural research activities, and some government engineering laboratories. In six days, under perfect conditions, the group saw many of the things which had been points of issue in the discussions. Even more important in my opinion was the opportunity to really get to know each other. Have you ever played "The Game" simultaneously in seven languages? It's tough, but I've done it. By the time the trip was half over we had sixty people in the club car doing just this, and singing and entertaining each other – as united a group of nations as we could ever hope for, united first on an intellectual basis and second on actual understanding of each other and each other's problems. I think that in itself shows one of the chief things that we accomplished. And I want to tell you much more about it when you get back.

With very best regards,

Bob



The new Conservation Exhibit will bring the story of our resources "right into the city," Governor Dewey said at the ground-breaking ceremony on July 25, 1949.

GOVERNOR TURNS GROUND FOR CONSERVATION EXHIBIT

Governor Thomas E. Dewey officiated on July 25 at the ground-breaking ceremony for the twelve-acre conservation exhibit to be built at the New York Zoological Park. In his speech to the 200 people attending the function he said that the new exhibit will bring "right into the city the story of the proper and improper use of our resources" and "will serve to spread still further our knowledge of the interdependence of man and nature."

Designed to tell city people how their welfare is related to the conservation of soil, water resources, forests and wildlife, the exhibit is the first of its kind to be established anywhere. It represents the fruition of a partnership between the State and the City of New York and the Zoological Society.

Other speakers were Society President Osborn, Park Commissioner Robert Moses and Perry B. Duryea, State Conservation Commissioner. Prior to the ceremony, attended by many State and City officials, trustees, staff and members of the Society, the guests were entertained at a buffet luncheon in the Administration Building.

After Governor Dewey had turned the traditional first spadeful of earth he and other members of the group made a tour of the site of the new exhibit. Work has commenced on the exhibit's construction and plans for the finished show are well under way.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

Smallest Known Electric Eels Produce 15-30 Volts

Of the hundreds of Electric Eels that we have imported from tropical South America for exhibition and for research, the smallest was about 6 inches long, at which size it was fully equipped with more than 500 volts. Although we have kept some eels for more than 11 years, none has ever shown the slightest sign of breeding activity. Nor have we any definite information as to their reproductive habits in nature. All we have been able to learn from our collectors is that the adult fish disappear from their normal haunts during the rainy season, presumably proceeding to flooded swamp lands, and at the end of that season they reappear with a cloud of small eels, an inch or so long, swimming about the head of an adult. The sex of this parent, or whether both sexes take care of the young, is unknown, but at least one parent is reported to do so until the young are 5 or 6 inches long.

Recently we were advised by our agents in Brazil that they had collected for us a number of small eels. We fully expected to receive a group of one- or two-footers, and so were astonished to see that the longest of the 21 specimens was only 3 inches and the smallest half that length. The immediate problem was to find some food for them, but unfortunately we were unable to discover anything that they would touch. Not the smallest of earthworms, Daphnia, mosquito larvae, infusions of all sorts or Brine Shrimp would tempt them. Before the last of these unfortunate infants died, however, we were able to make measurements of their electrical powers. In all, we measured 4 fish. A two-inch fish, with electric organs one and one-half inches long and not as thick as the lead in a standard pencil, had a voltage of between 15 and 30 – an astonishing amount of electricity for so small a fish. – C. W. Coates.

Mudspringers by Exchange

Any creature that seems to combine the attributes of both fish and frog deserves more than casual attention, and visitors at the Aquarium seldom fail to stop in front of the tank containing two new Mudspringers, studying these strange, amphibious fish with more than usual care. Despite the label clearly stating that they are fish, so frog-like is their appearance and behavior that people sometimes go away unconvinced that they are really not a "cross between a frog and a fish" or actually frogs themselves.

Only an inch or two of water is kept in the Mudspringers' tank, together with a small beach of sand and rock, and they spend more time out of the water than in it. In nature they hop about on mud flats and mangrove swamps in search of prey. It is reported that they are so agile that they can catch flies and mosquitoes on the wing. Collectors who have tried to capture them have no doubt of this alleged ability, for they are among the most difficult of all fishes to catch. Terrestrial locomotion is accomplished by means of paired pectoral fins that have strong, muscular bases and by the muscles in the body and tail. Using the former the fish "rows" itself along, dragging its body, but for speed it springs off the ground, using both body and fins. The effect is certainly more frog-like than fish-like.

The eyes add to the illusion because they are raised above the level of the head like those of a frog and can be partially rotated. From this

characteristic the fish gets its scientific name, *Periophthalmus*. Exactly what species we have is problematical, since the taxonomists have not decided whether the numerous populations extending from the tropical shores of Africa throughout the East Indies and northern Australia belong to a single species or to several different ones.

Mudspringers apparently must have water to breathe just like the great majority of fishes, so they carry some along with them, stored in two pouches on either side of their heads, during their overland jaunts. They can be seen filling up these pouches preparatory to coming out on the "beach" in their aquarium.

These, the first Mudspringers the Aquarium has exhibited since 1937, were obtained in an exchange of specimens with the Zoological Society of London. Before the War the zoological societies of London and New York exchanged a large number of specimens – fishes, amphibians, reptiles, birds and mammals. The War disrupted this helpful trading, but old ties are finally being reestablished, to the benefit of all concerned.

– J. W. A.

Dr. Beebe Honored

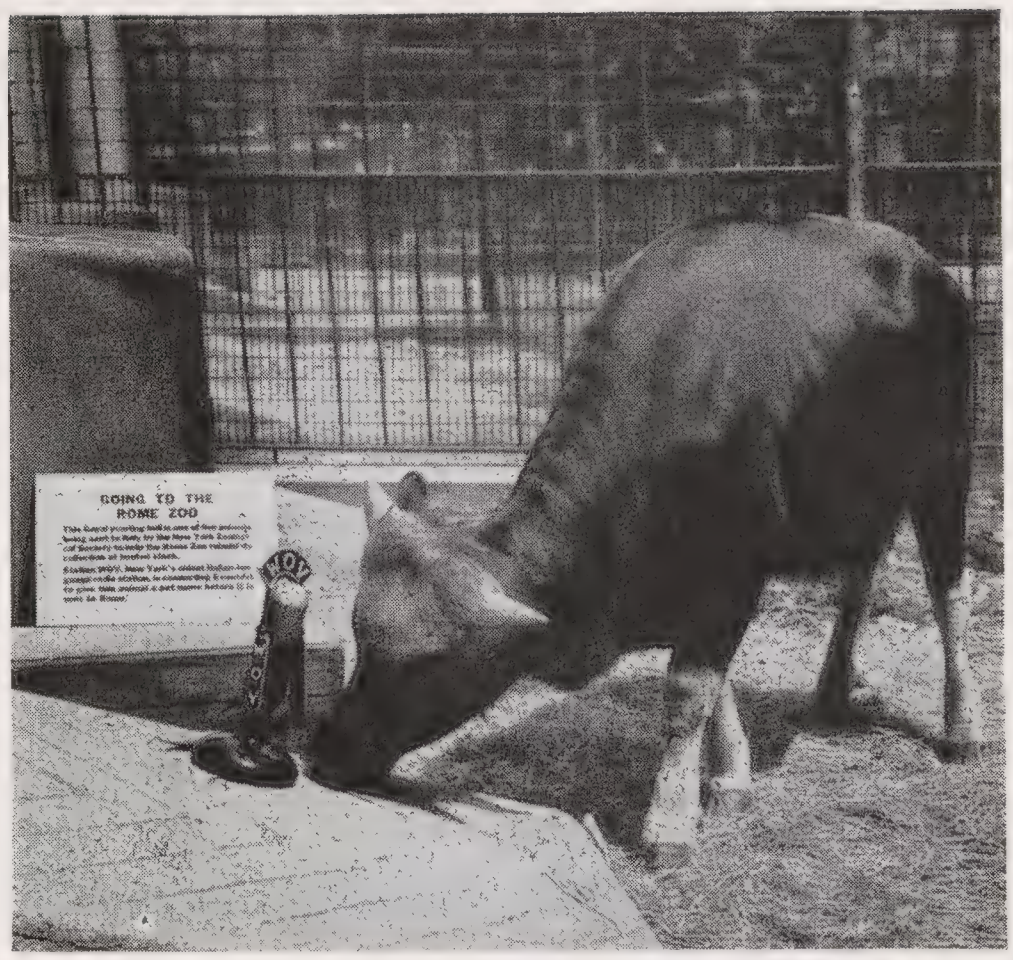
Dr. William Beebe has been elected a Corresponding Member of the National Academy of Sciences of Venezuela, in recognition of his "investigations relative to the flora and fauna of Venezuela."

We Are Sending Five Animals to the Rome Zoo

Early in the summer an attack of some infectious disease caused the Rome Zoo to destroy its entire collection of hoofed stock.

As a result of the suggestion of Fred Archer, one of the Zoological Park's painters, that we take the lead in helping the Rome Zoo reestablish its collection, General Curator Crandall offered a young Gayal, an Addax, a Nyala and two Guanacos to the Director of the Rome Zoo. The offer was accepted, and the animals will be shipped sometime this fall.

The young Gayal – born in the summer of 1948 – in particular attracted a great deal of attention because of its size, and radio station WOV, the oldest Italian-language station in New



A Gayal for the Rome Zoo

York, conducted a naming contest among its listeners. The name chosen was "Ser Capana," and a recording of the official naming ceremony will accompany the animals to Rome and will be broadcast at the time they are liberated in the Rome Zoo.

* * *

The male Congo Peacock chick that our animal collector, Charles Cordier, brought home from the Belgian Congo in June (together with six adults), has been officially named "Jimmy" on the Zoological Park's records, in honor of Dr. James P. Chapin of the American Museum of Natural History. Dr. Chapin discovered and named the Congo Peacock in 1936.

* * *

A Slow Loris was born in the Zoological Park on August 31, the first specimen of this lowly Primate ever born in the collection.

PUBLICATIONS OF INTEREST

A CONSERVATION HANDBOOK. By Samuel H. Ordway, Jr. 76 pp. The Conservation Foundation, New York, 1949. $1.00.

In one small, neat packet, for $1.00, you and I can now provide ourselves with tools for understanding the terms, concepts and practices of Conservation. It was high time somebody wrote a handbook, for Conservation is showing up more and more in our magazines and newspapers and while its technical terms are hardly to be classed as "jargon," plenty of them have special connotations that require special understanding.

Most of us have a pretty good idea of the general

Conservation problems of soil, water, forests and wildlife, I suppose – but a somewhat-less-than-good idea of, say, the exact meaning of Dry Farming, Watertables, Biotic Potentials and Check Dams. This is the book for us, for Mr. Ordway has prepared concise definitions of a total of 347 such terms, all classified and strung together so that we read, not as in a dictionary, but as in a textbook and come out at the Glossary-Index end with an over-all picture of the major fields in which Conservation is concerned.

The plan of the book (or handbook, for it is a comfortable and beautifully printed little thing, only 4½ by 7 inches) is simple. There are ten section headings:

I Of Conservation and Resources Generally
II The Nature of Renewable Resources
III Important Concepts
IV Approaches to Conservation Practice
V Land Management
VI Forest Management
VII Range Management
VIII Water Management
IX Wildlife Management
X State and National Parks, Monuments and Wilderness Areas

Within these categories Mr. Ordway has stated the key terms and concepts and practices and has defined them briefly and pungently. The glossary-index defines still other terms, of less than major importance, so that the entire terminology of modern Conservation is quickly at our command.

"A Conservation Handbook" is the first formal publication of The Conservation Foundation, in whose official family Mr. Ordway is a vice-president. It is basic and will be found illuminating not only by the lay reader (most of us) but by teachers and the school room. Indeed, it is already being considered for school-wide distribution in one State.

Members of the New York Zoological Society should be informed especially along the lines of this handbook, for its subject-matter is destined to appear very often in our magazines and meetings. They may acquire "A Conservation Handbook" by sending a check for $1.00 to The Conservation Foundation, 30 East Fortieth Street, New York 16, N. Y. Better still, buy several copies at this moderate price and send them to young people thinking about a career in Conservation! – W. Bridges.

THE INSECT WORLD OF J. HENRI FABRE. Edited with an introduction and notes by Edwin Way Teale. 333 pp. Indexed. Dodd, Mead & Company, New York, 1949. $3.50.

Anyone expecting to delve into an extensive biography of J. Henri Fabre or to get a fresh glimpse of his exciting world of insects, or to be enlightened with startling photographs for which Edwin Way Teale is justly famous, will be disappointed in this book. It is not that kind of book.

For the most part it consists of a compilation of selected papers, or extracts of papers, which over the years have been published in many tongues and appeared in many editions. The papers are those of J. Henri Fabre: classics in their field, poetic in their conception, scientific in their approach.

It is gratifying to find so many otherwise scattered papers bound in one volume. Most of the better known works of the celebrated naturalist are included and some of the lesser ones, although an account of the Common Wasps and the Anthrax Fly is regrettably missing.

Mr. Teale has contributed an introductory chapter, giving in concise form the salient points of Fabre's long and busy career. Interpretive comments at the beginning of each chapter seek to help the American reader to visualize the type of insects Fabre had under observation and to compare them with counterparts in this country.

The arrangement of chapters, however, is somewhat disconcerting; and in spots the nomenclature has regrettably not been brought up to date. For instance, the word "Grub" is no longer used to designate a mosquito wriggler or a dragon fly nymph, a locust is not the same thing as a grasshopper, and a caterpillar – not a butterfly – damages cabbages.

Two great poet-observers directed the power of their pens to revealing secrets of the insect world. One was Maurice Maeterlinck, Belgian, and the other J. Henri Fabre. Both belonged to a preceding generation. Neither was an entomologist. Each made mistakes. Yet because of their insight, perseverance and intellectual honesty they will continue to inspire readers for generations to come.

Mr. Teale has enhanced our appreciation of Fabre, insect wizard of France, by providing pertinent background material for the man and his works.—Brayton Eddy.

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This is really a superb job, one that needed doing. It is a handbook that should particularly interest Members of the New York Zoological Society.

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NEW YORK ZOOLOGICAL SOCIETY

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ANIMAL KINGDOM

NOVEMBER–DECEMBER

1949

Vol. LII No. 6

SMITHSONIAN INSTITUTION
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50th ANNIVERSARY OF THE NEW YORK ZOOLOGICAL PARK

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ANIMAL KINGDOM

BULLETIN OF THE
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For the General Good

THE SUPREME COURT of the United States rendered a decision on November 7 that may well prove of far-reaching significance. It endorsed a basic concept of Conservation, namely, that owners, whether large or small, of natural resources need to think of themselves as custodians of property that shall be used for the general good. The Supreme Court's ruling supported an earlier one rendered by the Supreme Court of the State of Washington. The circumstances that led up to this ruling were that an individual had disputed the constitutionality of the State law requiring timberland owners to re-seed or re-stock their land in order to maintain forest reserves and cover. Excerpts from the State Supreme Court's ruling are worth quoting:

> "We do not think a state is required under the Constitution of the United States to stand idly by while its natural resources are depleted and high authority supports our view.
>
> "Edmund Burke, eighteenth century English statesman, once made the following statement: 'A great unwritten compact exists between the dead, the living and the unborn. We leave to the unborn a colossal financial debt, perhaps inescapable, but incurred, none the less, in our time and for our immediate benefit. Such an inviolate compact requires that we leave to the unborn something more than debts and depleted national resources.'
>
> "Surely," the State Court stated, "where natural resources can be utilized and at the same time perpetuated for future generations, what has been called 'constitutional morality' requires that we do so."

The people of our country, together with most people the world over, prefer a minimum of compulsion by law. A far more desirable alternative is voluntary action. This concept of trusteeship in regard to natural resources needs then to become part of our national point of view. Today it is more than a theory. It now becomes a principle endorsed by our highest courts of law. Any way one looks at it the ideals which give life to the Conservation movement are acquiring a new reality.

Fairfield Osborn

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Our Changeless World

BY WILLIAM BEEBE



Dr. Beebe joined the staff of the Zoological Park on October 16, 1899, and on the fiftieth anniversary of the event his associates presented him with a memorial book of letters from friends, illustrations of memorable events in his career, and the like. This is an illustration of mythical "Tetrapteryx beebei."

• I •

On October fourth, 1899, Professor Henry Fairfield Osborn and I left the American Museum for my first visit to the Zoological Park. We took the Ninth Avenue elevated with its coal-burning engine, to 125th St., across town by horsecar to the New York Central Railroad station, and thence, in seventeen minutes, to Fordham. From here we went by cab to the park. Such were the means of transportation fifty years ago. At that time movies and radios, submarines and airplanes were unheard of, as were comic strips, income tax, cross-word puzzles, camouflage and propaganda. Women neither smoked nor voted and had not yet thought of lipstick. There was as yet no chestnut blight and the origin and cure for malaria, yellow fever and typhoid were as yet mysteries. There were just one-half as many Americans alive then as there are today.

Any comparison of all this with present conditions existing in 1949 is futile, for not only yearly, but weekly and hourly our civilized world changes.

We, of the Department of Tropical Research, consider ourselves especially blessed in that our own world of exploration has remained unchanged throughout the past five decades. In 1910 it seemed to me that India and China were filled to overflowing with human beings, and today they seem even more densely packed. But elsewhere, from upper Burma and the Himalayas to the hinterland of Venezuela and British Guiana and the depths of the sea, all these are as they were in 1899, and indeed, as they have existed throughout millions of years before our forefathers adopted clothes and fire and sought shelter in caves.

In January we start on our expedition to Simla. Although the island of Trinidad has been inhabited by mankind for at least five centuries, we know that the birds, reptiles and insects of the preserved mountain forests around us are unaffected by, and unaware of man's existence on the earth. The same is still true of the jungles of Kartabo and Rancho Grande. Rumors of war and uneasy peace, strikes, politics and iron curtains pass us by; planes may roar high overhead, while unseen radios snatch waves from the air around us, but in our chosen jungles none of these trouble us. For a few more years the field naturalist can enjoy special sanctuary and leave so-called civilization out of sight and mind.

• II •

Soon after I received my appointment to the Zoological Park I had a memorable conference with Prof. Osborn and Governor Theodore Roosevelt. They talked about future work and

DEC 1 - 1949

handed out some unforgettable advice. My primary concern was to plan and oversee the erection of suitable buildings and aviaries for birds, to assemble an adequate collection, and to keep my birds in health. But both my mentors urged me to devote all spare time to watching the birds, to study their songs and habits, to breed them whenever possible. In brief, to enter as much as a human being could into their instincts, perhaps to discern flashes of intelligence, to try actually to become a bird or other creature, to understand their sensory perceptions and their specific personalities.

Throughout the years, both in the zoo and on expeditions, we have tried hard to follow the advice of these two great men; we have recorded much and understood pitifully little. But every minute has been sheer joy.

Here is a selection of four, from many hundreds, of paragraph glimpses which various creatures have given of themselves. Each incident is in no sense a new discovery, but portrays some bit of drama, some emotion which exists as a direct result of the impact of its environment on the life of the living creature. The reaction of this upon our own mind, while it must always be considered as an "AS IF," is yet very vivid and real. Perhaps the two are not quite worlds apart.

Ritual of the Albatrosses[1]

THE ALBATROSSES at their nesting grounds on Hood Island, Galapagos, showed not the slightest fear of us. We walked about, gently pushed them off their egg and replaced it, without protest, and now and then they performed their remarkable ritual dance.

There are three phases in the life of an albatross, each of which arouses in us a widely different emotion; first admiration for its superb powers of flight, second, amusement at its ridiculous gait, and third, sheer amazement at the elaborate detail, complicated sequence and formality of its solemn pantomime.

As I sat and watched, less than six feet away, an albatross walked up to its brooding mate which immediately rose and faced her partner. They stood with their breasts about a foot apart. Albatross number one suddenly shot its head and neck straight up, the bill pointing skyward, uttering at the same time a deep, grunting moan. Its mate followed suit, then, alternately, each bird bowed deeply and quickly three times. Without an instant's delay they next crossed beaks and with rapid vibrating movements of the head, they fenced – there is absolutely no other word for it – with closed mandibles. Without warning my first bird ceased and again shot his head high up into the air. His mate instantly turned her head and neck far sideways and held them motionless and concealed from view, close to her left wing and side. Then another double bow and a second bout.



With slight variations this ritual continued for five minutes, when a third bird approached, bowed and engaged bird number one. This was only half-hearted and number three soon waddled away and the pair renewed their astonishing performance.

I walked over to the third bird and bowed deeply, and to my delight it bowed in return. Seeing no rapier bill, however, it solemnly walked away, until I again faced it and bowed, when it returned my salutation twice and took a step toward me. That was as near as we could come to an engagement, but I shall never forget my amenities with this feathered D'Artagnan of Hood Island.

[1] Albatross, *Diomedea irrorata*. 1925. Hood Island, Galapagos. "The Arcturus Adventure."

The Death of a Sea-lion Pup[2]

On the island of Guadalupe, off the coast of Lower California, I sat on an isolated ledge at the head of a small beach and counted eight small, matted and trampled brown pelts of baby sea-lions, infants which had come to untimely ends. As I watched the deserted beach, to my surprise a young sea-lion scrambled out of the white smother of waves and began hitching itself up toward me. For a moment I hoped that its tameness indicated a sea-elephant pup, but my glasses showed it a sea-lion, very small and exceedingly thin. The upper parts of its little limbs and its ribs showed clearly through the skin. Before it had reached the first of the exposed rocks it had fallen over five times, and now and then it stopped, swallowed and give a silent cough. I sat immovable and at last it reached a red boulder at my feet, slippery and worn mirror-smooth. It spent many minutes trying to climb up the low ridge where I was seated, a feat which any well sea-lion could have accomplished in a single effort. But this pitiful little chap would only roll over backward and then have a paroxysm of coughing. At last it gave up the attempt



and crept under the shelter of an over-hanging ledge, and there sat in the sunlight turning its head from side to side. When it saw me approach it opened its eyes wide and half turned, but had no will to do more. I watched it for a while, so rare is the sight of a sick or dying animal. I then sent it a little prayer for a speedy end to its pain, and left it among the dried bodies of its infant fellows, in the small sea-lion cemetery on the shores of Guadalupe.

[2] Sea-lion, *Zalophus californianus*. 1937. Guadalupe Island, Mexico. "Book of Bays."

The Incredible Sloth[3]

A gun fired close to the ear of a sloth will usually arouse not the slightest tremor; no scent of flower or acid or carrion causes any reaction; a sleeping sloth may be shaken violently without awakening; the waving of a scarlet rag, or a climbing serpent a few feet away brings no gleam of curiosity or fear to the dull eyes; an astonishingly long submersion in water produces discomfort but not death. When we think what a constant struggle life is to most creatures, even when they are equipped with the keenest of senses and powerful means of offense, it seems incredible that a sloth can hold its own in this overcrowded jungle.



This is how the sloth's lines of defense become operative. First the swaying branch and dizzy height are in his favor, as well as his immovable grip. To begin with the innermost defenses, while his jungle fellows the ring-tailed and howling monkeys have thirteen ribs, the sloth may have as many as twenty. In the latter animal they are, in addition, unusually broad and flat, slats rather than rods. Next comes the skin

which is so thick and tough that arrow or shot often is deflected without even scratching the hide. The skin of the unborn sloth is as tough and strong as that of a full-grown monkey. Finally we have the fur – two distinct coats, the under one fine, short and matted, the outer long, harsh and coarse. Is it any wonder that, teetering on a swaying branch many a jaguar has had to give up after frantic attempts to strike his claws through the felted hair, the tough skin and the bony lattice-work which protects the vitals of that edentate bur, the sloth!

[3] Sloth, *Bradypus tridactylus*. 1917. Kartabo, British Guiana. "Jungle Peace."

The Retrogression of a Hoatzin Chick[4]



SOMEDAY, we of the Tropical Research Department will bring a living hoatzin chick to the park, and to watch it will be like travelling backward in time for one hundred million years. The adult hoatzin is a broad-tailed, high-crested pheasant-like bird in browns and chestnut. The chick is a step-child of the Cretaceous Period – like a downy toothless lizard, climbing skilfully by the use of fingers and claws as well as toes.

Many years ago such a nestling, only a day or two out of the egg, watched me approach in a canoe, pushing through the low branches of trees growing along a muddy stream in British Guiana. His mother flew from the nest and as far as he knew he was being attacked by a monstrous creature. His pitiful little head with its stout beak appeared over the edge of the nest and with terrified eyes he stared down at me. As the branch shook, the reptilian mite reached up to the nearest twigs and climbed rapidly, his clawed thumbs and forefingers being of more use than his feet. Now and then he craned his gaunt neck, turtle-wise.

As he reached the outermost twig he prepared to play his last trick, one that set him apart from all modern land birds, as a frog is set apart from a swallow. The young hoatzin stood erect for a moment, and then both little, naked wing-arms dangled loosely. For the fraction of time he leaned forward, then without effort he dived straight downward, as cleanly as a seal, direct as a plummet and very swiftly. There was a slight splash, and as I gazed with real awe I watched the widening ripples undulate over the muddy surface.

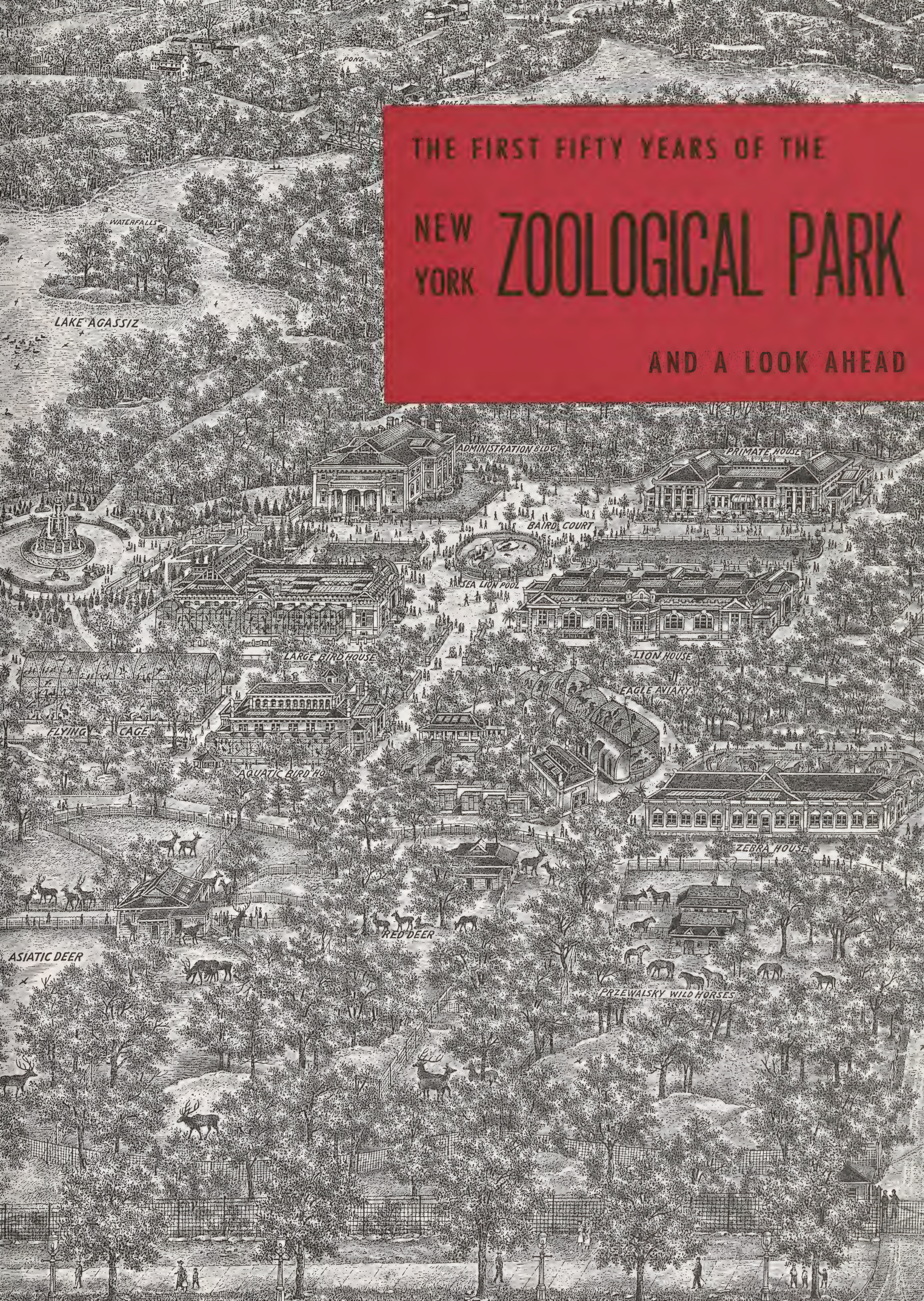
The curtain of the past had been lifted and I had been permitted a glimpse of what must have been a commonplace millions of years ago. Here was a modern living bird climbing like his ancestral lizard, and then, though a veriest nestling, performing like still more ancient amphibian forebears, and trusting himself to a fifteen foot dive, a distance fifty times his whole length.

I sat quietly and watched. After a while a skinny, two-fingered mitten of a hand reached up from the muddy flood, and the black and dripping nestling chinned itself out on to a twig. The mother now came close and with hoarse rasping notes and frantic heaves of wings and tail lent encouragement. Just before I paddled from sight, when the little fellow had almost reached the nest, he opened his beak and gave a weak falsetto cry, tailing off into a guttural rasp, *Whee-og!* His splendid courage had broken at last; he was nearly home and he was aching to put aside all this terrible responsibility, this pitting of his diminutive might against such fearful odds. He wanted to be a helpless nestling again, to crouch on the springy bed of sticks, with a feather comforter over him and to be stuffed with delectable leathery pimpler leaves. At least these were the emotions we chose to read into his actions.

[4] Hoatzin, *Opisthocomus hoazin*. 1916. Berbice River, British Guiana. "Jungle Peace."

THE FIRST FIFTY YEARS OF THE NEW YORK ZOOLOGICAL PARK

AND A LOOK AHEAD





There were dedication speeches in front of the Aquatic Bird House

How simply, almost casually, we opened our gates to the future that afternoon of fifty years ago! Except for the faded photograph reproduced on this page we have no pictorial record of the actual dedication of the New York Zoological Park on the afternoon of Wednesday, November 8, 1899. We have the official printed version of the addresses and some dusty copies of the printed program. Nothing else.

"It was decided" (so reads the Fourth Annual Report of the New York Zoological Society, for 1899) "to mark the opening day by a simple ceremony, and the public was invited more for the purpose of viewing the completed construction work in the Park than to view the collections of living animals, although some features of the latter were very creditable." For months, it appears, "the pressure from visitors desiring to view all the living collections had been very great." And so the simple ceremony was arranged and the visitors invited to look at the few completed buildings and the nucleus of the collection.

The Honorable Levi P. Morton presided and a little after 3 o'clock he called to order the meeting of two or three hundred persons. There was a temporary platform, "suitably draped with the national colors," at the north end of the Aquatic Bird House, and the guests stood close around it, probably shivering a little, for there was a cold northwest wind. The whole ceremony and speech-making could not have lasted much more than half an hour.

November 8

1899 was the day...

PRESIDENT MORTON introduced "the man who has done more than any other for the establishment of this Zoological Park, Professor Henry F. Osborn."

It was a deserved tribute to a great scientist. In his turn Prof. Osborn spoke of Nature's endowment of the Park, the liberality of the membership, the cordial cooperation of the municipality, the devotion of the staff. Two representatives of the City and the Borough of the Bronx spoke briefly. Then Mr. Morton arose:

"Ladies and Gentlemen: I now take great pleasure in declaring the New York Zoological Park, and all its collections, open to the public."

Whereupon the assembly "left the terrace and the platform, passed through the Bird House, up Birds' Valley to the Reptile House, Bear Dens, and Buffalo House, where it dispersed."



Members inspected the newly-opened Bear Dens

1900



Engineers and builders swarmed over the Zoo this first calendar year, finishing the Reptile and Aquatic Bird Houses and the Flying Cage, starting the Lion and Primate Houses, fencing corrals. Animals arrived before there was room for them. It was a jumble — Otters wintering in the turtles' tanks, Peccaries in the Buffalo Shelter, the Tortoise Room turned into a restaurant. But the public loved it and 525,000 came, 20,000 in a single day. At the year's end the Zoo had 106 species of mammals, 104 of birds and 110 of reptiles—1,493 specimens.

THE FLYING CAGE WAS OUR MOST SPECTACULAR EXHIBIT

1901



Things were beginning to take shape now — just before Christmas the Primate House was opened, the $250,000 Park Improvement Fund was raised before the agreed date, a Veterinary Department was established and the Zoo proudly dispatched an animal collector to Alaska for specimens. Use of the name "Zoo" or "Bronx Zoo" instead of "The Zoological Park" irked Dr. Hornaday and he corrected the offenders severely. There was a major disaster — three Orangs and a Chimpanzee died of an infective colitis within a few days.

THEN, AS NOW, VISITORS ENJOYED THE PRIMATE HOUSE



1902

A BARREN GROUND MUSKOX WAS AN EXCITING RARITY

Members and friends vied in presenting a superb collection to the new Lion House, but the builders were slow and the house was not opened until 1903, thereby creating an acute housing problem. A Sumatran Rhinoceros had to sleep in a monkey cage for weeks, finally was sold to the circus. Rarities were almost commonplace: Prjevalsky's Wild Horse, the first Muskox seen in an American Zoo, our first Thylacine, a Himalayan Burrhel. Attendance jumped to three-quarters of a million, the collection to nearly 2,000 animals, 448 species.

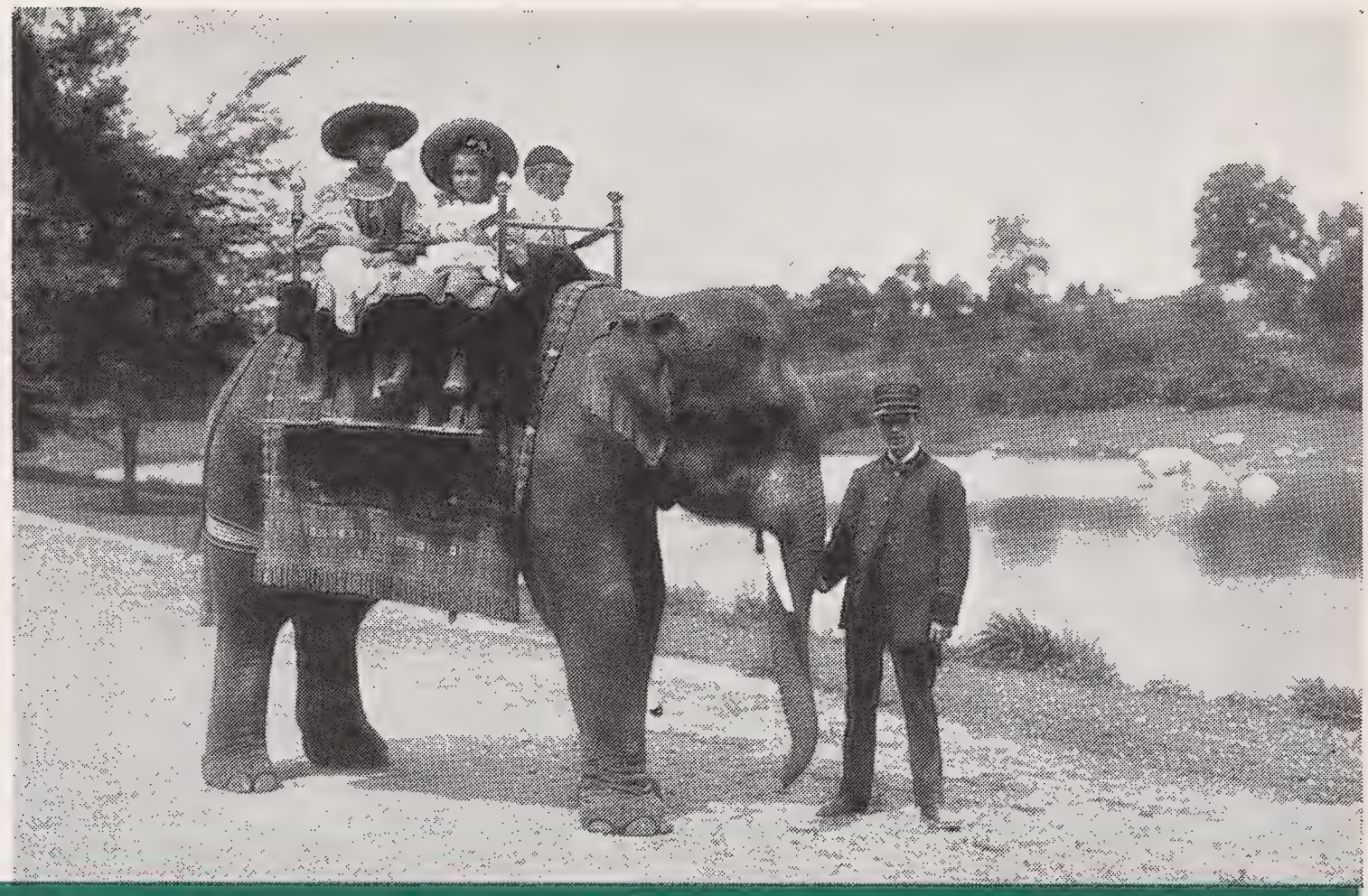


1903

TALL ELMS NOW SHADE THIS CORNER OF BAIRD COURT

This was a year of great accomplishment — the Lion and Antelope Houses were opened and Ostrich, Small Mammal and main Bird Houses were started, more than $25,000 (a large sum in the animal market of those days) was spent on new specimens, and the famous Whitney herd of 26 Bison came as a gift. It was the largest herd on exhibition anywhere. The Reptile Department had two deadly Bushmasters, the Mammal Department boasted a pair of 10-foot Giraffes and a Siamang. Attendance broke a million for the first time.

1904



Two more major buildings were opened this year, the Ostrich and Small Mammal Houses, but there was still a shortage of accommodations because Director Hornaday was not able to resist buying rare specimens that came on the market. By means of an ordinary postcard the Prince of Pless offered to sell two European Bison and a

OUR FIRST ELEPHANT WAS THE LATER-NOTORIOUS "GUNDA"

Society member promptly bought them for the Zoo. Another member gave our first Elephant. A pony-and-elephant riding track became popular overnight, and visitors marvelled at a totem pole in the Zoo.

1905



A strenuous building and planting program made this a notable year. Baird Court was taking form, the main Bird House and the Pheasant Aviary were opened (the latter stocked by the gifts of a member) and the animal census shot up as accommodations increased, to 657 species and 2,867 specimens. Attendance rose to more than a mil-

AND THIS WAS THE SITE OF THE ADMINISTRATION BUILDING

lion and a quarter, the floor of the Reptile House wore out under the feet of visitors and had to be resurfaced, and the single telephone line connecting the Zoo with the city was found to be insufficient.



1906

PETER THE GREAT HAD A FINE FIGURE IN THOSE DAYS

In anticipation of an Elephant House, the Zoo started acquiring animals and storing them in the Antelope House. Samuel Thorne presented an enduring gift — a 3-year-old Hippopotamus named Peter the Great that is still (1949) with us. The Glass Court of the Bird House was finished and the animal population jumped again, to 3,624 specimens of 818 species. A National Collection of Heads and Horns was started by Dr. Hornaday's gift of his own collection. A special officer was hired to stop the shooting of wild birds in the Zoo.



1907

WE SENT FIFTEEN BISON TO FOUND A NATIONAL HERD

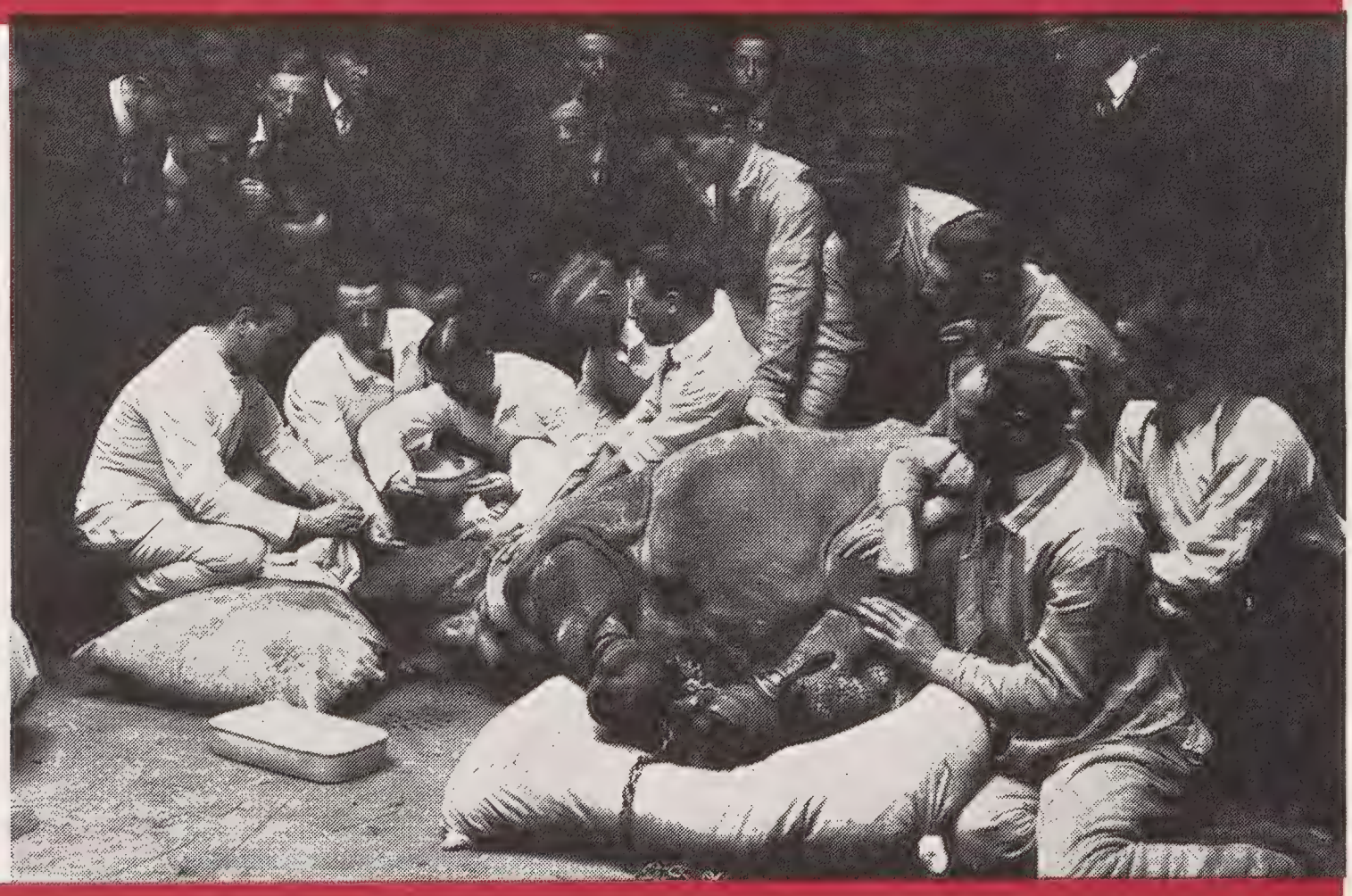
The Zoo was "seven-eighths complete" at the end of 1907. The Small Deer (Kangaroo) House was opened, the Elephant House under construction, 22,500 trees and shrubs and flowers planted, the Italian Garden finished. The New York Zoo ranked first among the zoos of the world in number of specimens (4,034), fourth in species—not bad for an institution less than 10 years old. We sent 15 Bison to found the Wichita National Bison Herd, started a new technical publication called "Zoologica," gave a lecture course to 3,500 school children.

1908



The entire Zoo staff rejoiced this year over the opening of the Elephant House, "acknowledged to be the finest zoological building in the world." The only complaint—visitors crowded inside and stayed too long! Alice, the Indian Elephant, balked at being moved from the Antelope House to the new building, and had to be dragged by a crew of laborers. The Administration Building was started, the bird collection was proclaimed the largest in the world in number of specimens—2,615. The Zoo began a campaign against littered walks.

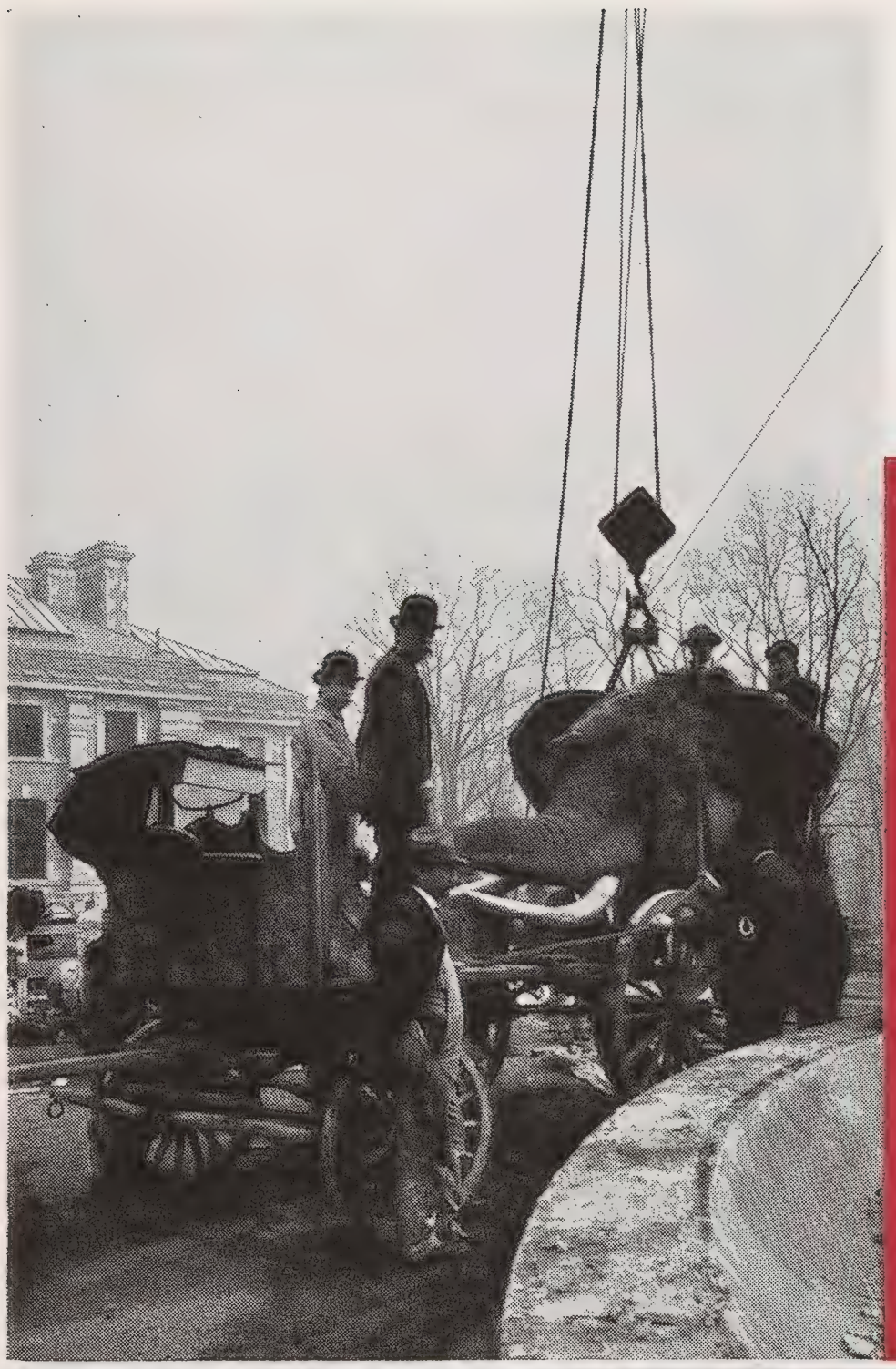
"PETE" THE HIPPO ARRIVES AT THE NEW ELEPHANT HOUSE



1909

Ten years old and already recognized as one of the great zoological institutions of the world, the Bronx Zoo (as people persisted in calling it, despite Dr. Hornaday's admonitions) had justified all the hopes of its founders. Attendance exceeded a million and a half, there were 5,000 specimens of 1,117 species in the animal collections, so many baby animals were born that the Zoo was embarrassed by its excess of hoofed stock; 10 overflow dens had to be built for surplus bears. Col. Kuser gave funds for a pheasant study by Curator of Birds Beebe.

THE AFRICAN RHINOCEROS UNDERWENT AN EYE OPERATION



1910

A TROPHY ARRIVED FOR THE HEADS & HORNS COLLECTION

Auspicating its second decade, the Zoological Park opened its new Administration Building near the end of the year. From Baird Court the Rockefeller Fountain was moved to its present site in the Parking Circle. Paul J. Rainey presented a fine Arctic collection of Muskoxen, Walruses and Polar Bears—the latter being "Silver King" and "Silver Queen," famous for many years. We acquired the first Spectacled Bear seen alive in the United States. An insect exhibit was set up in the Reptile House, band concerts were held in the Zoo.



1911

CHIMPANZEES AND ORANGS WERE TRAINED TO PERFORM

The Zoological Park demonstrated its initiative by sending an expedition after Gorillas, capturing a young female which lived 12 days after arrival. It was the first living Gorilla seen in the United States. There were important births in the Zoo—a Prjevalsky Wild Horse, a Rocky Mountain Goat, five Bison. The Zoo was still a wild place: a covey of quail lived near the Administration Building, a colony of Night Herons was established, Turkey Vultures soared overhead. We exhibited two of the almost-extinct Carolina Parrakeets.

1912



PIGMY HIPPOPOTAMUSES CAUSED A GREAT SENSATION

The last of the major animal buildings in the Zoological Park were opened this year —the Zebra House and the Eagle & Vulture Aviary. These completed the original plan. Thereafter rebuilding and modifications went on year after year but there were no important changes in the animal installations for almost 30 years, until 1941 and the concept of moated continental units. Three Pigmy Hippopotamuses, the first in the New World, were acquired. Gunda, the fractious male Indian Elephant, caused a furore by trying to kill his attendant.



1913

Significantly, in view of the emphasis it later was to put on education, the Zoological Park stocked and supervised an exhibit of live animals in the new Washington Irving High School. A collection of wild animal paintings was started, and the first canvases hung in the Zoo. We sent 14 magnificent Bison as a nucleus of the Wind Cave National Bison Herd, three rare Mikado Pheasants were exhibited for the first time in this country, and a Prosector was appointed to make full scientific use of animals that died during the year.

DR. DITMARS FORCE-FED A HUNGER-STRIKING PYTHON



1914

THE YOUNG GORILLA MADE PERAMBULATOR EXCURSIONS

The World War caused a virtual shutdown of animal importations from the Old World but the Zoological Park considered itself in good condition, with its collection at the high level of 1,179 species and 4,353 specimens. For the first time attendance exceeded 2,000,000 visitors. Dr. Hornaday carried on a bitter war against litter on the walks, and equally bitter was a newspaper attack against the Zoo for chaining Gunda, the Indian Elephant, during musth periods. Our expedition returned from Africa with a young female Gorilla named "Dinah."

1915

"IVAN" WAS THE BIGGEST OF OUR ALASKAN BROWN BEARS

A dismal year. Almost no animals could be obtained abroad and a wave of losses hit the Zoological Park—Gunda the Indian Elephant, Congo the Pigmy Elephant, Dinah the Gorilla, Sultan the Barbary Lion, Billy the Alaskan Brown Bear. But we got a good collection of mammals and birds from Brazil and the Reptile Department concentrated on specimens from the United States, keeping all cages reasonably filled. Dr. Hornaday won his anti-litter war with the aid of Mayor Mitchel, who assigned detectives to make arrests in the Zoo.



1916

Things began to pick up. Ellis Joseph arrived from Australia with 46 kinds of mammals and birds. Col. Kuser gave 216 pheasants of 15 species, the Loring Expedition returned from Africa with 52 species, our new British Guiana Tropical Research Station sent 315 specimens and Dr. Ditmars caught 560 snakes and amphibians in South Carolina. A new technical journal, "Zoopathologica," was begun, the Animal Hospital was opened, Keeper Toomey was bitten by a rattlesnake and saved by serum, infantile paralysis cut Zoo attendance.

THE ZOO WAS PROUD OF
ITS NEW HOSPITAL EQUIPMENT



1917

All thoughts turned to war. Co. A of the Zoological Park Guards was formed, equipped with real rifles at the Society's expense, drilled and practiced marksmanship. A Red Cross base was set up in the Lion House to make bandages and supplies. All vacant land in the Zoo was ploughed and planted in vegetables. In exchange for a big collection of poisonous snakes Brazil sent us 250 tubes of rattlesnake serum to be used by the American Army. Food rationing was tried on the larger mammals but they were not patriotic and lost weight.

ZOOLOGICAL PARK GUARDS
MANEUVERED ON BAIRD COURT



1918

ARTISTS WERE ENCOURAGED TO PAINT THE ZOO'S ANIMALS

"The most unsatisfactory year in the history of the Zoological Park" was Dr. Hornaday's description of 1918. There was a serious coal shortage, employees were being drafted, important animals died, the government placed an embargo on animal imports. In the Small Mammal House 26 cages stood empty. We bred homing pigeons for the Army, kept war gardens and the Zoological Park Guards going, sent a quart of dried rattlesnake venom to Brazil to make serum. Several rare birds were bred, including Upland Geese and a Banded Curassow.



1919

A BREEDING PAIR OF EMUS HATCHED AND REARED CHICKS

Attendance rose above the 2,000,000 level for the first time since 1914. The government tightened restrictions on imports of hoofed stock because of disease in many parts of the world and the Zoo was unable to get important collections awaiting shipment from South Africa and Australia. The King and Queen of the Belgians visited the Zoo, we dispatched a gift cargo of 56 mammals, 224 birds and 49 reptiles to Antwerp to help restock its Zoo. Our first Pigmy Hippopotamus was born, the reptile collection set its best record for completeness.

1920

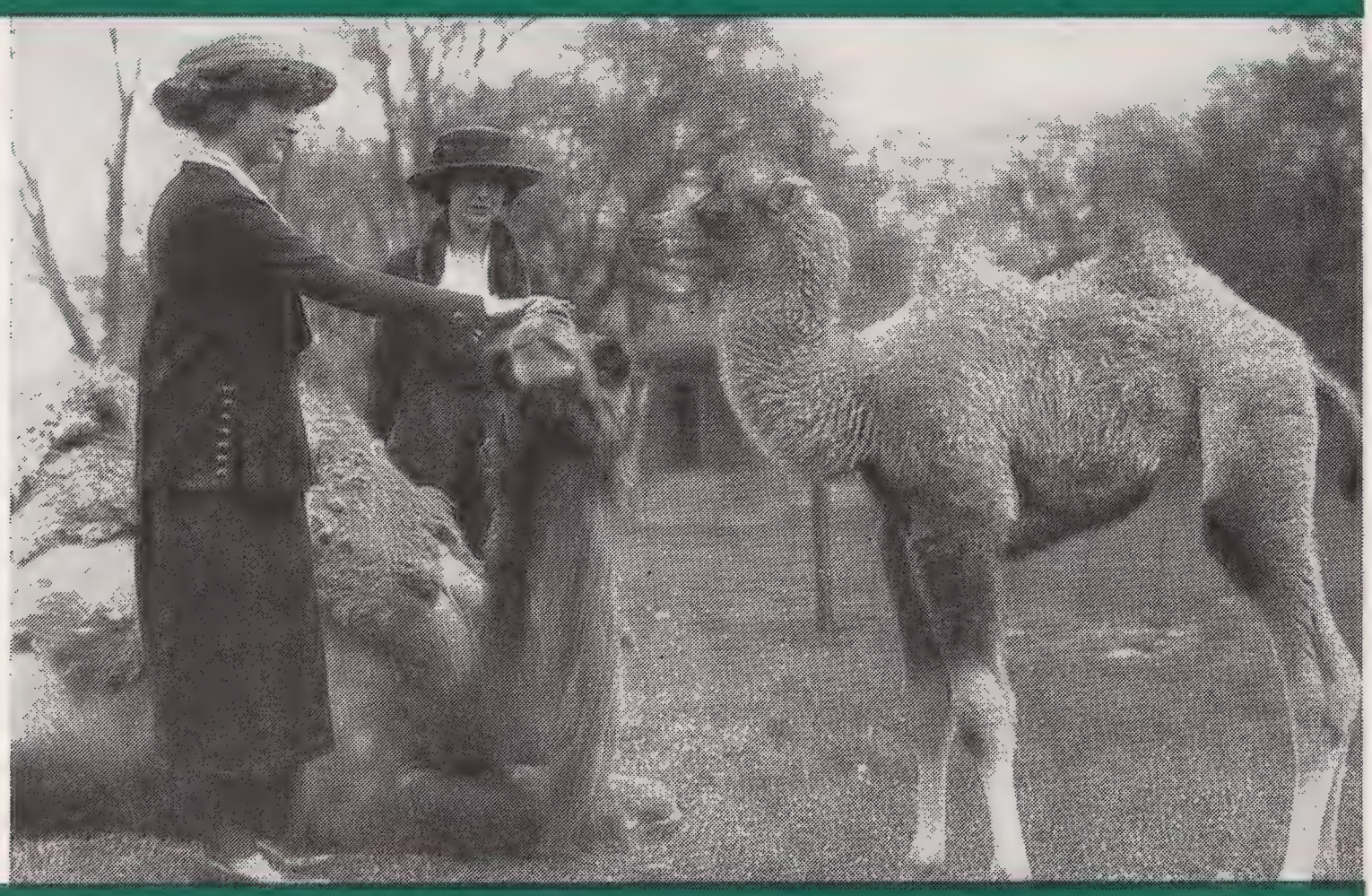


Once more a great tide of important animals came into the Zoological Park, from South Africa, Australia and Europe. Most unusual was a Koala from Australia, never before exhibited in the United States but so specialized in its diet of eucalyptus leaves that we managed to keep it only a short time. Large collections were sent to the

A SPECIMEN OF THE INAGER WAS IMPORTED FROM PERSIA

London, Pretoria and Johannesburg Zoos without leaving noticeable gaps in our exhibits, attendance went to two and a quarter millions, and a more optimistic tone prevailed in the Society's publications.

1921



It was indicative of the "safe" status of the American Bison that this year the Yellowstone National Herd was able to send us four fine animals to replenish our stock, depleted by donations to help found the national herds. Four of the almost-extinct Trumpeter Swans came into the bird collection, now at a high peak of rarities. We sent

SMITH COLLEGE SENIORS CHRISTENED A BABY CAMEL

reptiles to London Zoo and the serum institute in Brazil, gift animals to the Jardin des Plantes in Paris. The Carnegie Institution concluded five years of work in the Zoo, on metabolism and nutrition.



1922

THOUSANDS CAME TO SEE THE DUCK-BILLED PLATYPUS

Zoological history was made this year by the exhibition of a Duck-billed Platypus. It lived only seven weeks, but thousands of visitors stood in line to see it, first of its kind ever to come out of Australia alive. There were other important "firsts"—Baird's Tapir and Cape Fur Seals. A member presented another African Pigmy Elephant and we received five Muskox calves and two more Orang-utans. The big cat collection was the best in the Zoo's history, we had three 20-foot pythons, the Heads & Horns Museum Building was opened.

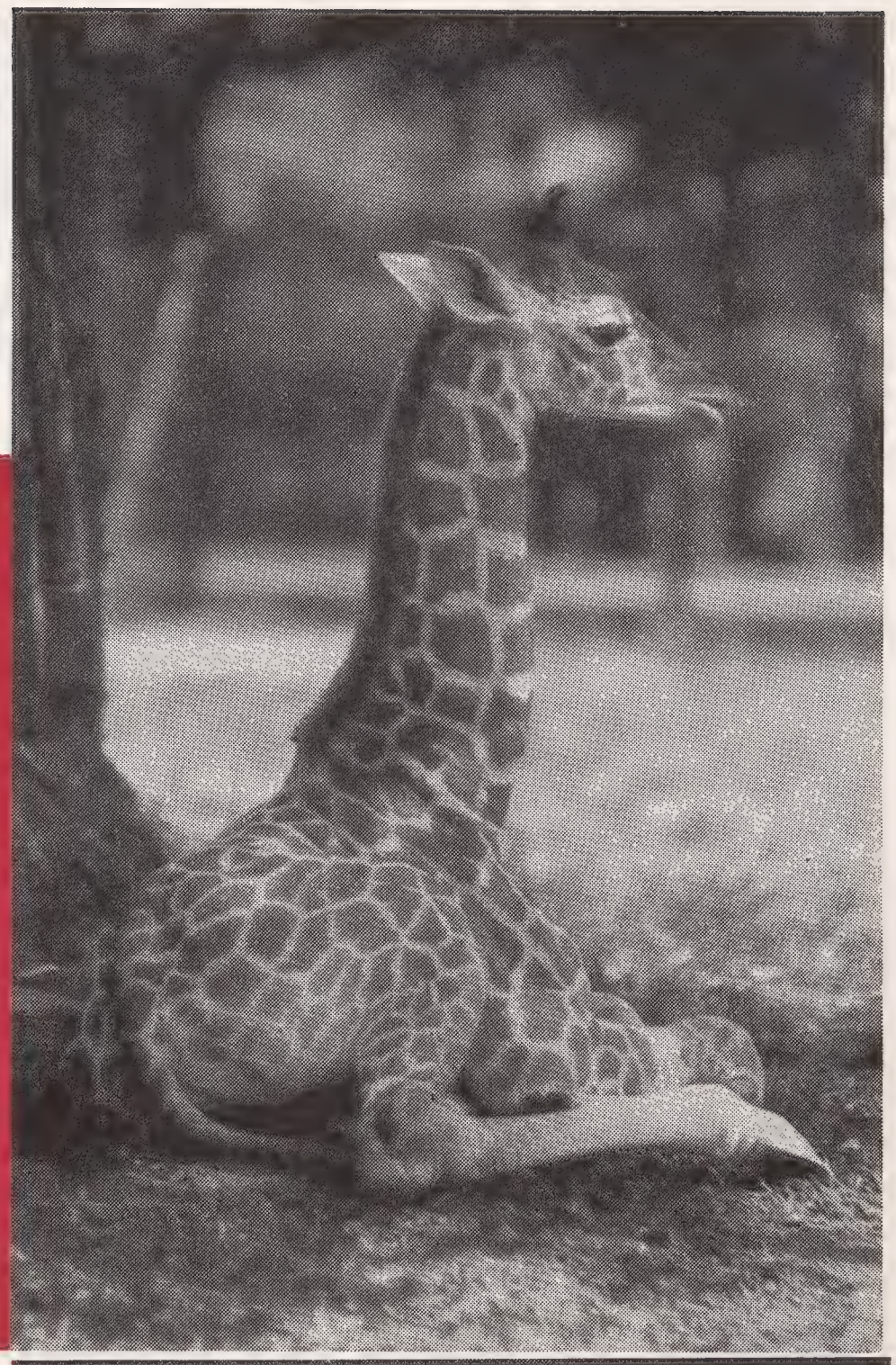


1923

HELEN KELLER VISITED US AND "SAW" ANIMALS BY TOUCH

Utilization of the Zoo's animals for educational purposes began to claim more and more of the staff's attention. A book by Dr. Hornaday was syndicated in 29 Sunday newspapers, animal movies by Dr. Ditmars were shown in the United States, Canada and England. We received six Bison from the Wichita Herd which we had helped form, Helen Keller and a party of Pueblo Indians visited the Zoo, Kartoum the big African Elephant wrecked part of his corral fence, and Ivan, our huge Alaskan Brown Bear, was modelled for Brown University.

1924



A PLACID BABY GIRAFFE WAS THE PRIDE OF THE ZOO

One experience taught the Zoo the value of a new medium—radio. A rattlesnake's rattle was broadcast, heard as far away as Iowa, and 400 letters poured in. Dr. Ditmars completed a series of 43 motion pictures about animals, an exhibit of Alaskan "huskies" was popular, we acquired a White-lipped Peccary after trying for 25 years, important births were a Giraffe and a Mountain Zebra, a friend gave us her squirrel collection. But concern began to be felt about restrictions in Australia and South Africa on wild animal exports.

1925



ANOTHER FAVORITE BABY WAS A ZOO-BORN MUSKOX

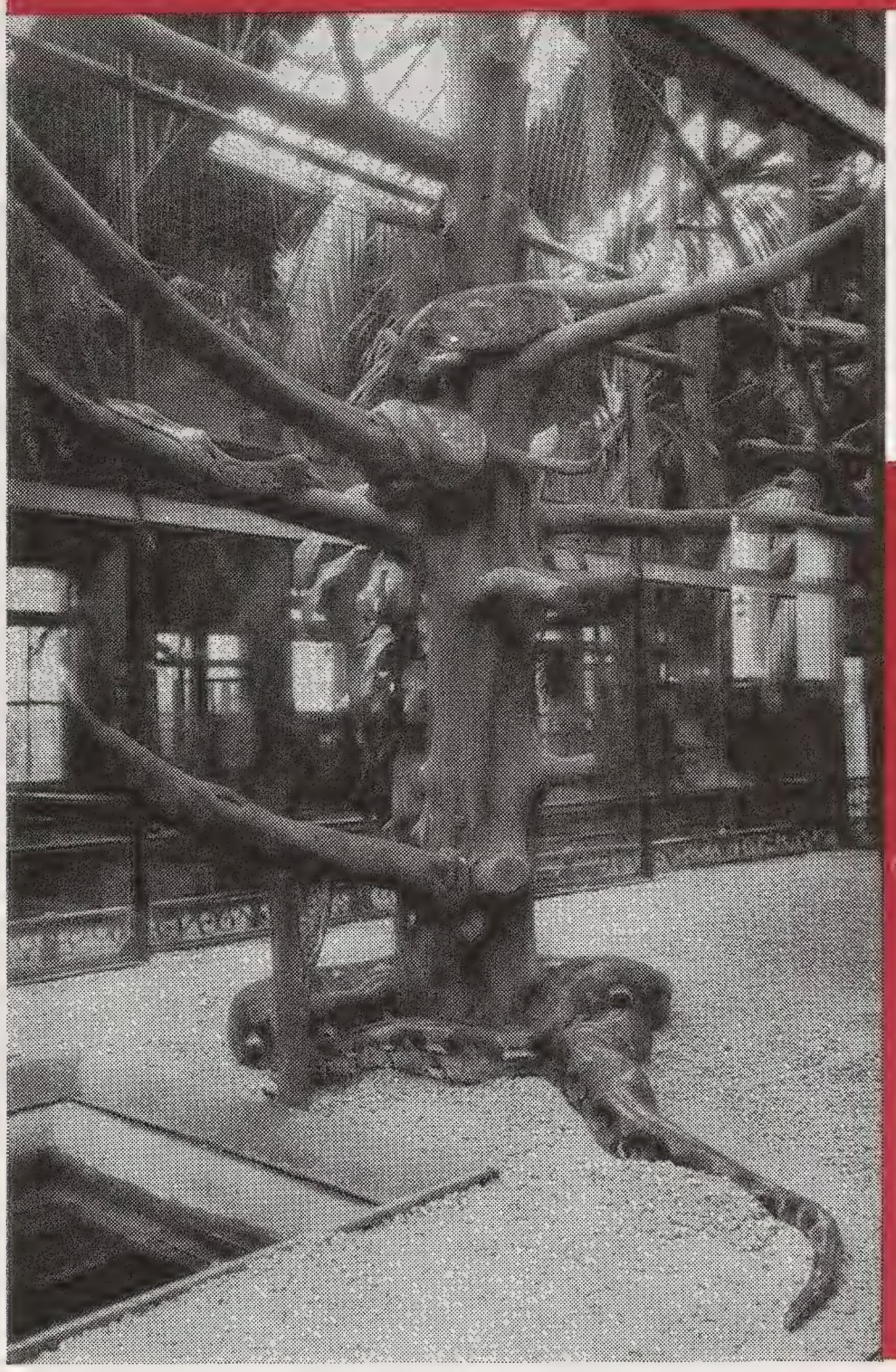
Pursuing its educational program, the Zoo gave a summer series of lectures for children in a tent, showing 5½ miles of motion picture film to 3,600 youngsters. It was a very successful venture. Broadcasts of "animal lore" were made weekly. We received an Abyssinian Wild Ass, the first one ever in captivity, and reared a young Red Howler Monkey on leaves. The Bird Department adopted a new policy of fewer but better birds, and Dr. Ditmars took a gallon of dried rattlesnake venom to Brazil to make serum, brought many snakes back.



1926

KING PENGUINS AMUSED VISITORS BY THEIR GRAVITY

The retirement of Dr. Hornaday after more than 30 years as Director of the Zoological Park was the principal event of this year. Dr. W. Reid Blair, veterinarian since 1903, succeeded him. It was a notable year, too, because of the rarities it brought us—two Komodo Monitors and a Shoebill, or Whalehead Stork, both important "first-timers." Four King Penguins were received, our African Elephant Kartoum was found to be 10 feet 4½ inches tall and still growing, and a Giraffe was born. Four spectacular species of Birds of Paradise were acquired.

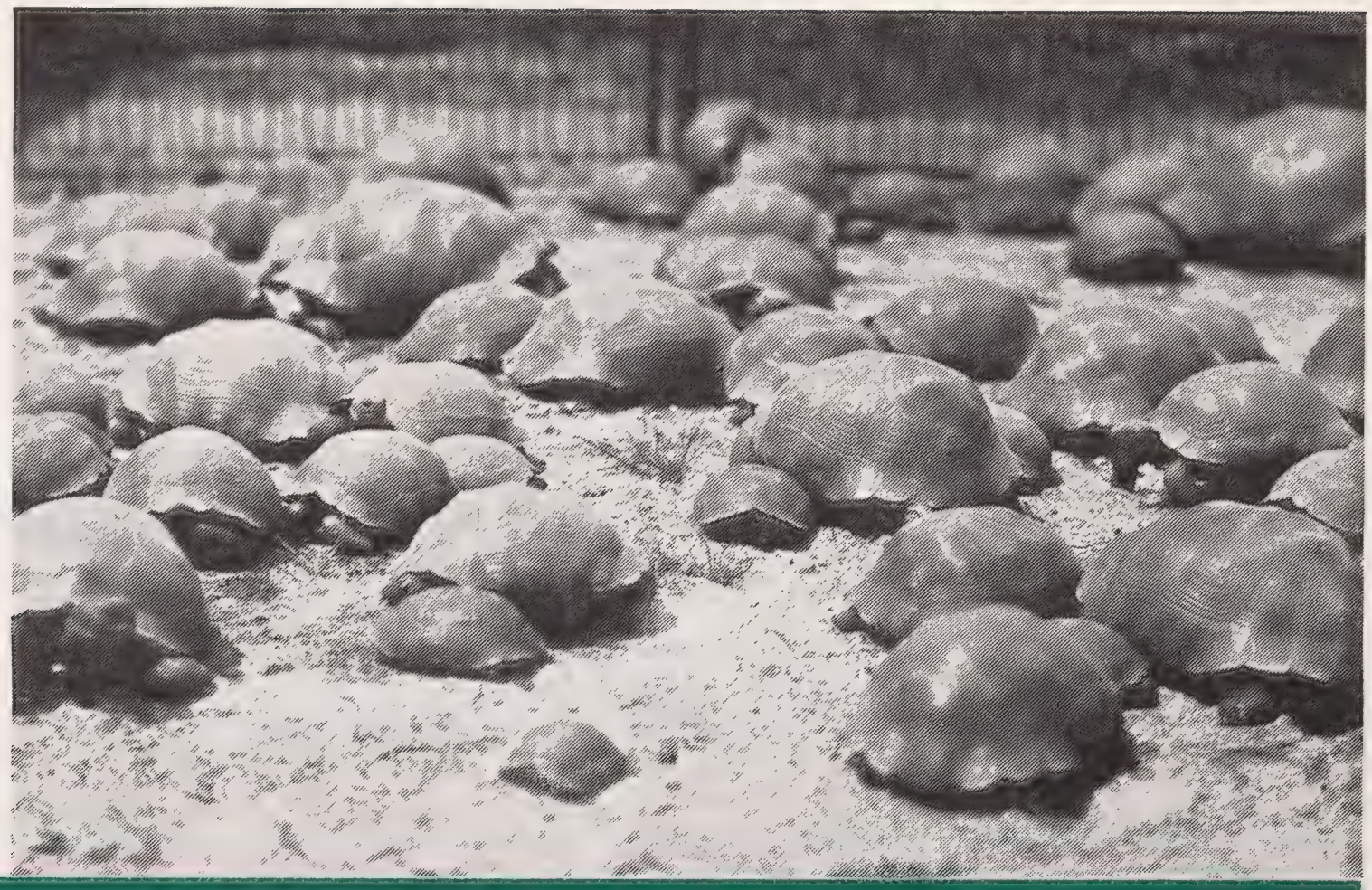


1927

A NEW PYTHON COMPARTMENT DRAMATIZED THE BIG SNAKES

Attendance kept creeping up—this year it reached 2,750,000. Director Blair made a trip abroad to see what European zoos were doing, a baby Elephant only 39 inches high was received from India, and the Animal Hospital was modernized by the installation of much new equipment. A glass-walled central compartment for pythons was built in the Reptile House and occupied by two fine specimens approximately 20 feet long. We acquired six Humboldt's Penguins, our first, and had great success in exhibiting delicate Ricord's Emerald Hummingbirds.

1928



Curator Crandall sailed for New Guinea to collect Birds of Paradise and Curator Ditmars went to Honduras to study methods of making snake-bite serum. Dr. Townsend of the Aquarium "boarded" 108 Galapagos Tortoises at the Zoo. From a missionary in Africa we got a young Gorilla and a young Chimpanzee, later to become well known as

WE WERE A DEPOT FOR GIANT GALAPAGOS TORTOISES

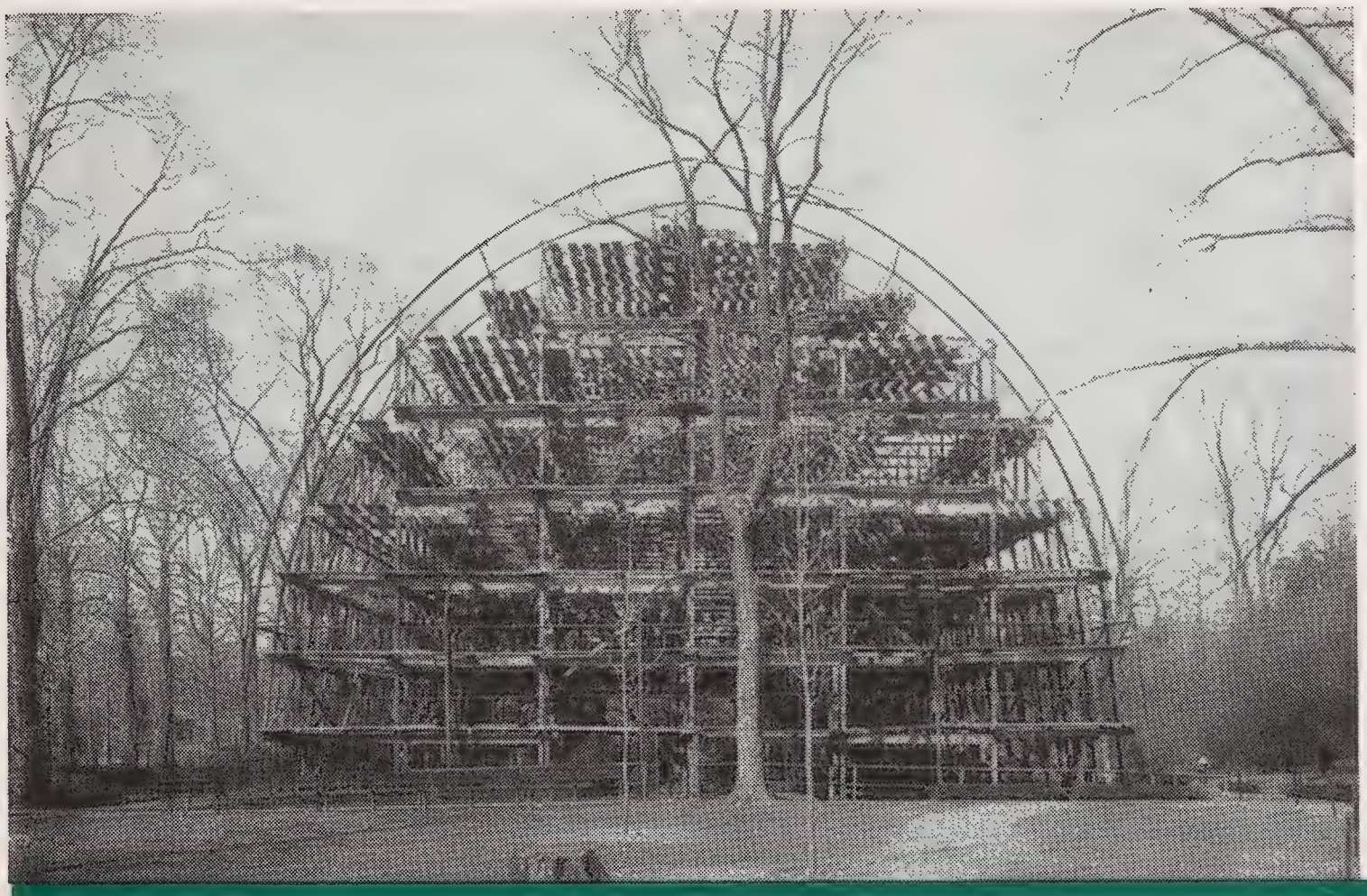
"Janet Penserosa" and "Ellen Allegra." A wave of vandalism hit the Zoo and the Shoebill was injured by a stone. New York University began a series of studies of the blood of our primates and camels.

1929

OUR EXPEDITION BROUGHT FORTY BIRDS OF PARADISE

The Zoological Park was thirty years old and gold medals were presented to the 12 officers and men who had been associated with it since the opening. A new department of education was established, with Dr. Leister in charge. Curator Crandall returned from New Guinea with 287 specimens of 75 species, including 40 Birds of Paradise—a magnificent addition to the collections. Members of the Society gave the Zoo a Tiger and six Polar Bear cubs, and we presented a Pigmy Hippopotamus to London Zoo at its centennial celebration.





1930

THE GREAT FLYING CAGE WAS COMPLETELY REBUILT

Thirteen species of Birds of Paradise were on exhibition, the finest collection anywhere. A Short-eared Dog from the Amazon basin turned out to be the second specimen ever recorded in captivity. Attendance increased to 2,900,000, the Flying Cage was rebuilt on the frame of the original one. Kartoum the African Elephant was measured and found to be 10 feet 8½ inches, just ½ inch under the famous Jumbo. Our Photographic Department rejoiced over a new invention, a flashbulb, which would replace the dangerous magnesium powder.



1931

"JANET" AND "ELLEN" WERE A FAMOUS ANTHROPOID PAIR

Dr. Blair went to Europe to look into the status of the Wisent, or European Bison, and found 64 pure-blooded specimens in existence—enough, he thought, to insure the preservation of the species. Unexpectedly and suddenly, Kartoum died and was found to weigh 10,390 pounds. Victoria, our Black Rhinoceros, also died, and both animals were replaced by young females. A record for hummingbirds was established by Ricord's Emerald, which lived 4 years 4 months and 5 days. Restored to health, our young Gorilla, Janet, was placed on exhibition.



1932

"Snake Island" was opened in front of the Reptile House with 100 specimens of 6 species, and Dr. Ditmars made a trip to the Canal Zone in search of the deadly bushmaster. No success. For the first time in its history the Zoo's attendance went over the three million mark. Negotiations for an East African Bongo, most beautiful of all

SEVERAL BLOOD PYTHONS WERE RECEIVED FROM MALAYA

the antelopes, were under way, a big shipment of reptiles arrived from Malaya, one of our Galapagos Tortoises laid four eggs—all infertile. Ornithological excitement was caused by an invasion of dovekies.

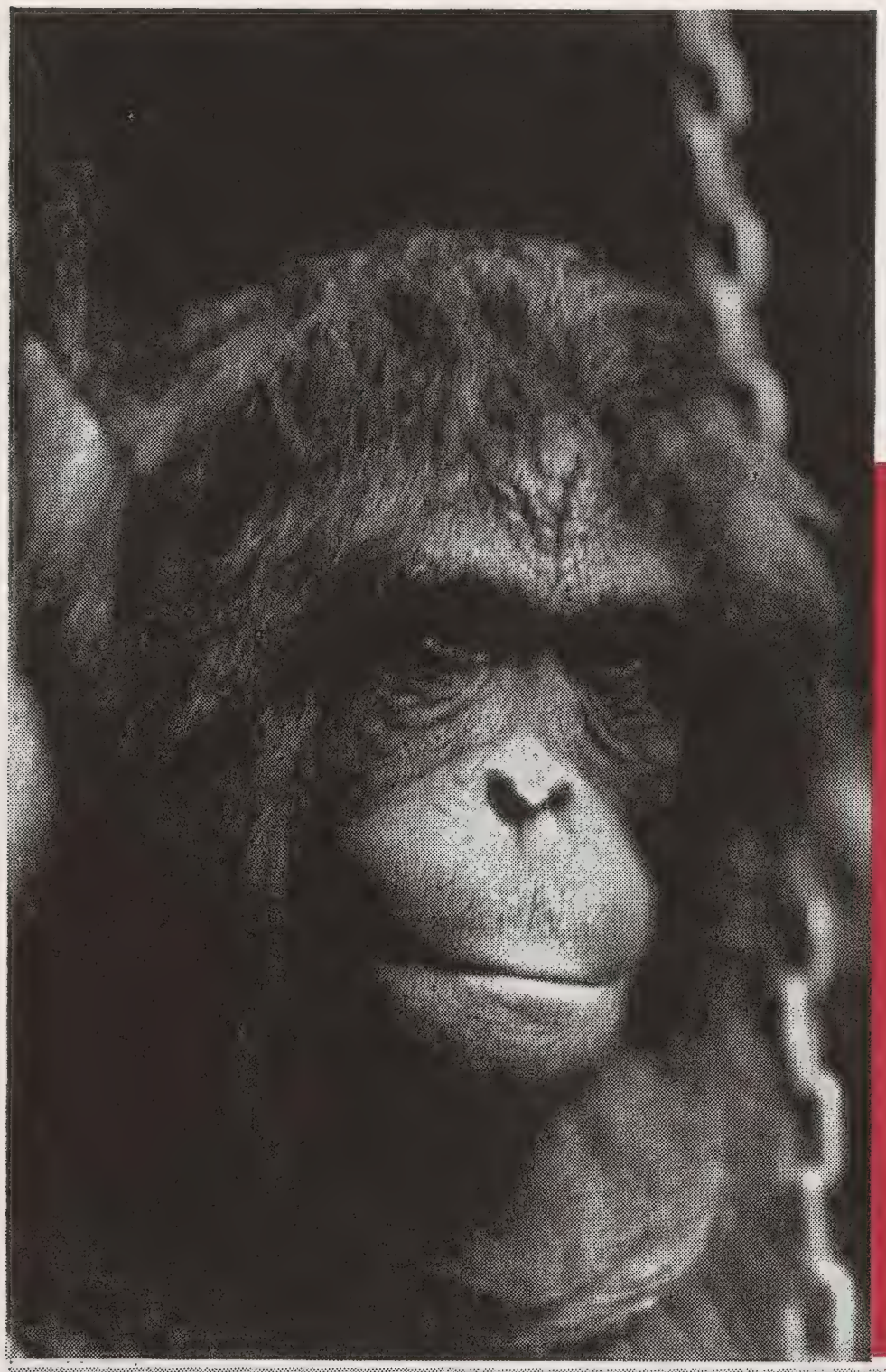


1933

Although this was the blackest of the "depression years," it started auspiciously for the Zoological Park with the arrival in January of Doreen, an East African Bongo, the first specimen exhibited in the New World. Doreen received great publicity, as did a Vampire Bat that Dr. Ditmars captured in Panama. Twin Lion Marmosets

"DOREEN" WAS THE FIRST BONGO IN THE NEW WORLD

were born, probably the first bred in the United States. The Department of Education noted increased calls for 16 mm. films on the part of schools and we took steps to provide more motion pictures of animals.



1934

AN ORANG NAMED "FREDA" WAS A MAGNIFICENT SPECIMEN

The great bronze gate at the Pelham Parkway entrance to the Zoo was dedicated in May as a memorial to Paul J. Rainey. Two "mystery bears" from Tibet turned out to be the rare Blue Bear, now exhibited for the first time. Two Komodo Monitors were on display again; they were big specimens of the so-called "dragon lizard." The Reptile Department got a bushmaster in Trinidad, the bird market began to show a little more activity, 50,000 school children saw our films, and Elwin R. Sanborn, photographer at the Zoo for 35 years, retired.



1935

WE EXHIBITED THE RARE LITTLE HAITIAN SOLENODON

Several rare and curious animals of great popular appeal came into the collection in the course of the year: Dr. Ditmars made a trip to Trinidad and came back with four Giant Bats which lived well in the Reptile House, and he also acquired a young Bushmaster; we got two Solenodons, the first in many years, and the first Giant Armadillo exhibited in this country. A series of photographs of Birds of Paradise in display was made, an ancient Goliath Heron died at the age of almost 23 years, and 70,000 children saw our films and slides.

1936



FEEDING THE PRONGHORNS
ALWAYS ATTRACTED A CROWD

Restlessness and a feeling that the Zoological Park must expand to meet the demands of its millions of visitors were noticeable this year. Animalwise there was nothing exciting except a Saiga Antelope, a curious puffy-nosed creature from the steppes of Siberia. We received a 4½-oz. Pigmy Marmoset, the first Ruby-throat Hummingbird since 1923 and a Wagler's Giant Cacique—the latter purchased sight-unseen from a lion trainer who didn't know what he had! Our Education Department began experiments with a novelty — 16 mm. color film.

1937



AN AFRICAN WATTLED CRANE
LOOKED MILDER THAN IT WAS

An exciting year, for it brought us three great rarities: an Okapi, the first ever seen in the New World; Quetzals, the first ever exhibited anywhere; the rare Wattled Crane from Africa. The Bird of Paradise collection was at its highest peak with 17 species on exhibition, and we showed 12 species of Hornbills. A brand new Guidebook was in preparation, new equipment was bought for the Animal Hospital, and its contacts with research institutions and hospitals that could use animal material for comparative studies increased greatly.



1938

WEIGHING "PANDORA" WAS A BIG JOB FOR TWO KEEPERS

The feeling about new directions the Zoo must follow began to crystallize; barless and moated enclosures were being planned. A baby Giant Panda, named "Pandora," came from China and captivated everyone by her antics. We got the first pair of Nyalas in the United States and set up an exhibit of Parasol Ants in the Reptile House. The Bird House got a new roof in the middle of the winter but guarded its collections so well that there were no losses from the cold. "The American Bison" was published and a printshop was established, to print labels.



1939

Its fortieth birthday found the Zoo full of life and vigor, with 82,000,000 visitors behind it and plenty of plans for the future. Pandora the Giant Panda was the star of an exhibit at the World's Fair, and a male Giant Panda was acquired. A new and beautiful Hummingbird cage was created in the Bird House, Animal Hospital work was

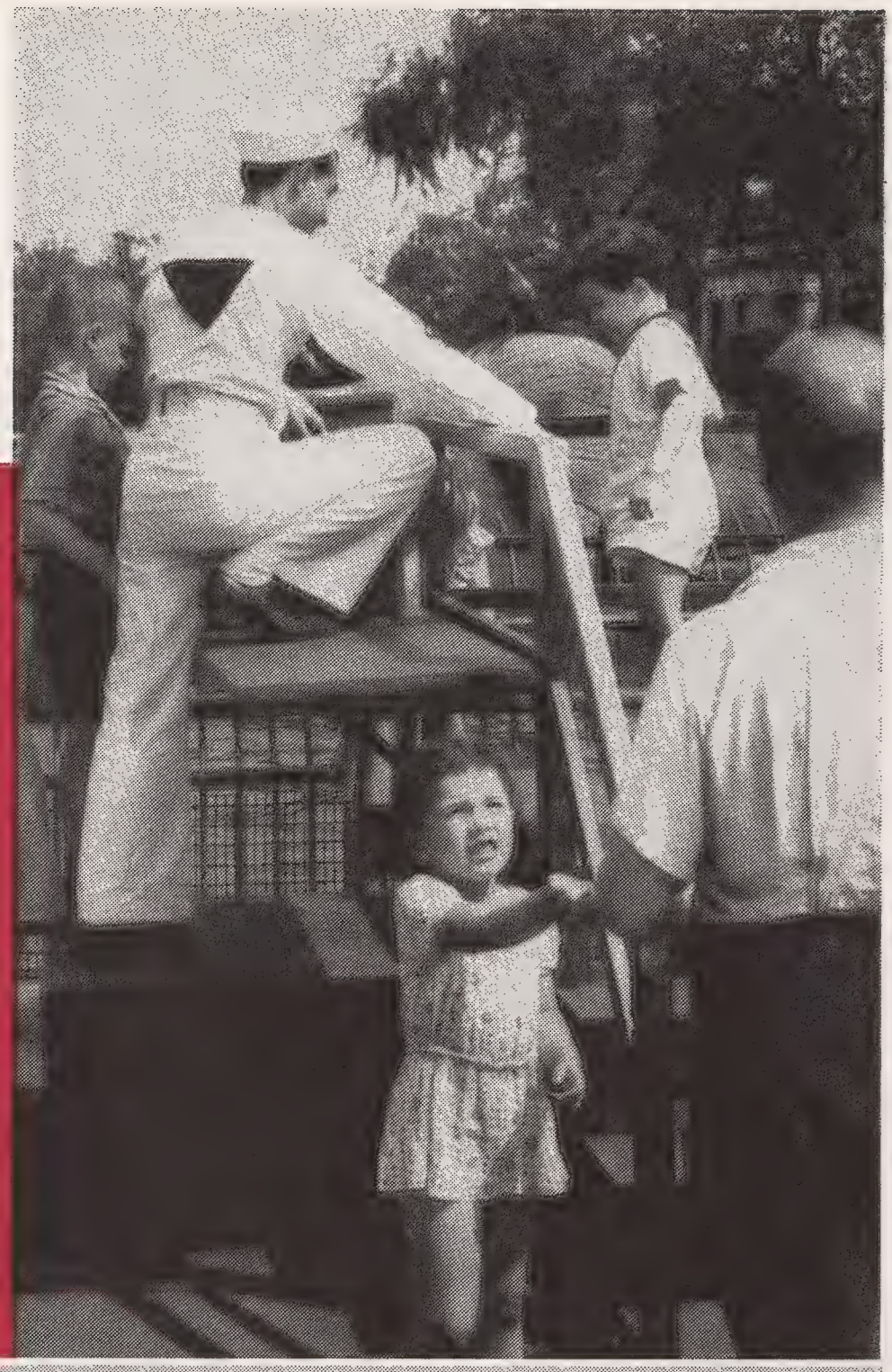
OUR ANIMAL STARS WENT TO THE WORLD'S FAIR

closely integrated with human diseases and Hospital associates published 15 technical papers in "Zoologica." Our films and slides were seen by 128,000 school children and the new, rewritten Guidebook was published.

1940

CHILDREN BEGGED NICKELS TO BUY FISH FOR SEA LIONS

Plans for modernization of the Zoo began to be put into effect; the African Plains was selected as the first new unit and on Christmas Day the Lions were turned out on Lion Rock for the first time. Dr. Blair retired as Director after 38 years, was succeeded by A. R. Jennings; H. R. Mitchell retired as manager after 41 years. A new riding track was built, animal food vending machines installed, World's Fair tractor trains were put in operation for rides around the Zoo and several art exhibits were held in the Heads and Horns Museum.



1941



The African Plains exhibit was opened and 83,000 people came the next Sunday—a record. Moated enclosures were built for the Giant Panda, Elephants, North American animals. We opened the Children's Zoo and the Zoobar Restaurant, modernized service yard shops. The Aquarium closed and its staff and some exhibits moved to the Zoo.

ZEBRAS GAVE PATTERN TO THE NEW AFRICAN PLAINS EXHIBIT

Under a new administrative plan the office of Director was discontinued, the Zoo's operations carried forward by a Planning Committee with Mr. Osborn, chairman; Mr. Tee-Van and Mr. Crandall, co-members.



1942

BARS DISAPPEARED FROM SOME ELEPHANT HOUSE YARDS

War began to affect the animal collections and there were no direct importations all year. The number of species and specimens declined slightly. The Farm-in-the-Zoo exhibit was opened, the "geographical" method of exhibition was extended to habitat cages in the Main Bird House, the "jewel room" technique was tried for bright tropical birds. Umbrella-birds, Quetzals and 52 Hummingbirds were brought from Costa Rica by our collector. There were 94 births in the Zoo. Fearing bombing, a west coast aviary sent us rare finches for safekeeping.



1943

THE NESTING OF A PENGUIN AMUSED ALL OF NEW YORK

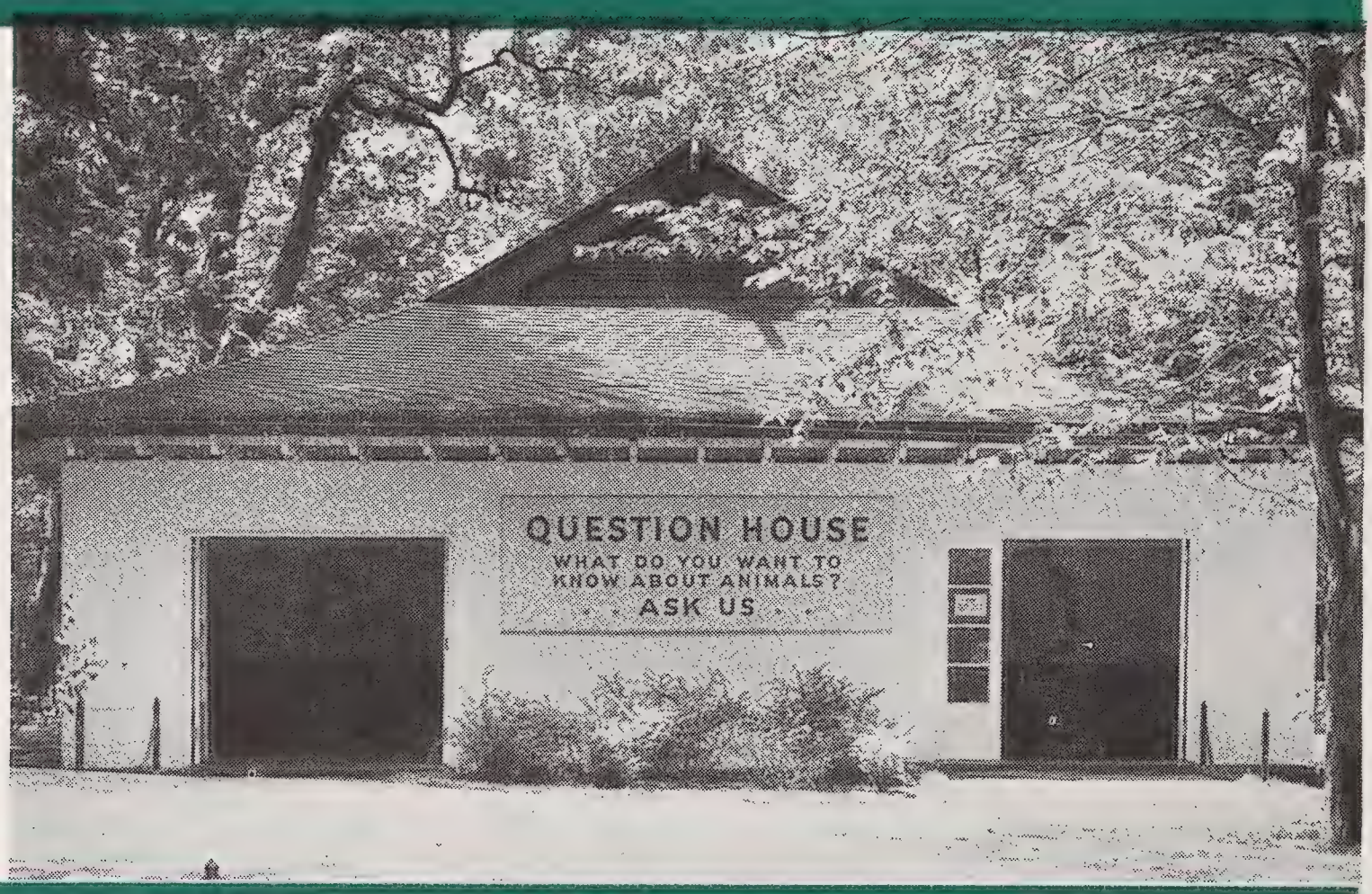
The mid-war year brought special problems and opportunities. The staff collaborated on war research, service men thronged the Park and presented animals to our "Mascot Menagerie," they copied useful information from our "Life in the Jungle" exhibit. We started modernizing the Gorilla and Small Mammal Houses, installed a public address system to give animal talks, recorded animal voices, exhibited trained Otters. We lost "Alice," the famous old Indian Elephant; the collections were down about 25 per cent. Lee S. Crandall became General Curator.

1944



As the war tide turned, plans for post-war development of the Zoo began to take form. Three Bengal Tigers were born and reared, South American shipments of birds began to arrive, our collector sent 33 Hummingbirds of five species from California and prospects for rebuilding the collections were brighter. The oldest animal died; it was "Old Nellie," a Griffon Vulture that had come in 1902. The Reptile House interior was modernized, the Animal Hospital found new war-time drugs useful, 166,000 school children saw our films and slides.

OUR THREE LITTLE TIGERS CAPTURED THE PUBLIC'S HEART



1945

The animal collections were reasonably intact when the war ended—surprisingly so, considering the food and import difficulties of the past four years. Zoo activities had expended tremendously within war-time limitations but the urge for physical expansion—new buildings, new exhibits—had to be curbed because of high costs. A new Insect Department was created with Brayton Eddy in charge, Question House was opened, the Otter exhibit built, the Jewel Room given its present form. A Wattled Crane was hatched and successfully reared.

QUESTION HOUSE WAS A SUCCESSFUL INNOVATION



1946

THE ZOO EXHIBITED ART BY THE SOCIETY'S MEMBERS

It was still impossible to plunge into a building program, and the expected flood of animal imports did not materialize, at least through normal channels. Important acquisitions were made nevertheless. Four specimens of Pere David's Deer came from the Duke of Bedford's herd, the first ever seen in this country; the Belgian Congo presented three young African Elephants; an Air Force pilot brought a magnificent Snow Leopard, and Ocellated Turkeys came from Guatemala. The Farm-in-the-Zoo was closed because of new highway construction.



1947

DAVID FLEAY BROUGHT THREE PLATYPUSES FROM AUSTRALIA

Few years equalled this one for great rarities. First came three Duck-billed Platypuses from Australia; then in quick succession a Monkey-eating Eagle, Tarsiers, Tree Shrews and Giant Rats from the Philippines; the almost legendary Yapock and the Three-wattled Bellbird from South America; King Penguins from the Antarctic; 21 kinds of Hummingbirds new to us. We built an "earthworm farm" to feed the Platypuses, completely modernized the Small Mammal House, and welcomed our hundred-millionth visitor since the opening of the Zoo in 1899.



1948

Definite plans for expansion were worked out although actual building continued to wait on more favorable times. In preparation for a new Penguin House, an experimental refrigerated cage was constructed and Penguins summered in it. Charles Cordier broke his leg in the jungle and return of the Congo Expedition was delayed

ANIMAL BEHAVIOR STUDENTS CONDUCTED SUMMER RESEARCH

a year. Summer Research Fellows in Animal Behavior worked in the Zoo for the second year, Mouflon were again exhibited, the Education Department recorded animal voices on tape, our first Moose was born.



1949

Contracts totalling more than a million dollars of Society, State and City funds were awarded early in the year and construction was started on a unique new Conservation Exhibit, on Great Apes and Penguin Houses. The Cordiers brought nearly 200 mammals, birds and reptiles, the greatest collection of rarities ever to come out of

THE CORDIERS BROUGHT BACK THEIR TROPHIES OF THE CONGO

the Belgian Congo, including the famous Congo Peacock, an Okapi and a Mountain Gorilla. A Pere David Deer fawn was born, schoolteachers thronged a course on how to use the Zoological Park's services.

and now... the next fifty years

By FAIRFIELD OSBORN

ONE WONDERS to what degree the founders of our institution foresaw the outcome of their action when they made their historic trip to Albany in quest of a charter more than half a century ago. The role of the prophet is difficult, and one suspects that the founders' vision of the development of the New York Zoological Society could scarcely have been framed in the terms of today and present reality.

This anniversary issue of our magazine is devoted principally to the story of the Zoological Park. We know from the records that when the Albany trip was made in 1895, even the site of the Park had not been determined. Our forebears were intent on giving the flourishing City a zoological park of distinction, in keeping with its other great cultural institutions, then for the most part in their early youth. It was a golden era when the City's future greatness was just beginning to be recognized, when public-spirited men were sharing their prosperity with the city in the form of museums, libraries, parks and other great civic works.

Again from the record we learn, in passing, that some of the founding fathers were not too happy about the location selected for the Park — "way up there in the country." Certainly they could not have foreseen the time when nearly three million people a year would visit us, nor the day when the one-hundred-millionth visitor had passed through the gates.

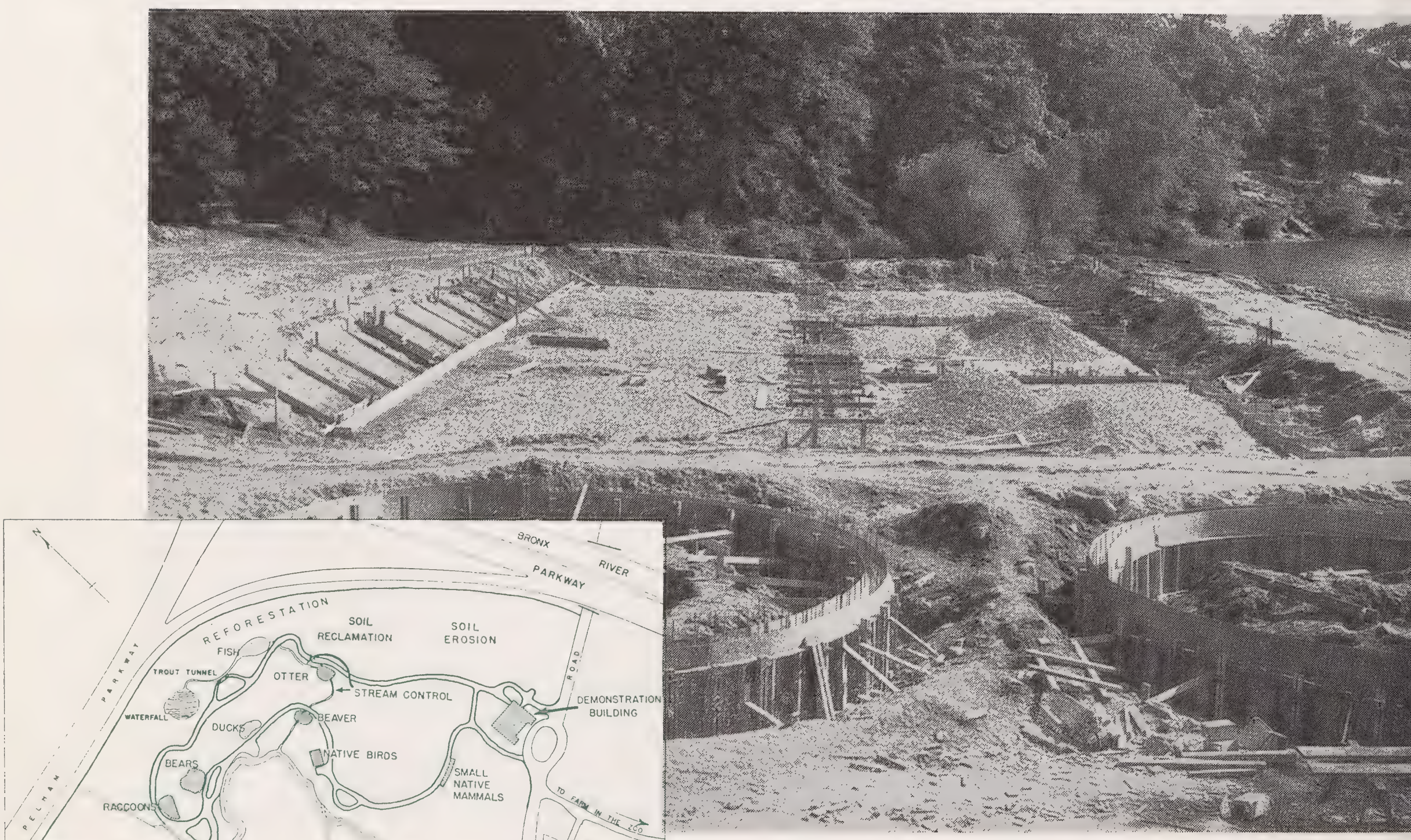
But they were committed to forge ahead with their plans and they opened the Zoo on a raw November day a few weeks before the close of the century. The last big exhibition building in their plan — the Elephant House — was completed in 1908. They, in partnership with the City, gave us the physical framework of this great Park.

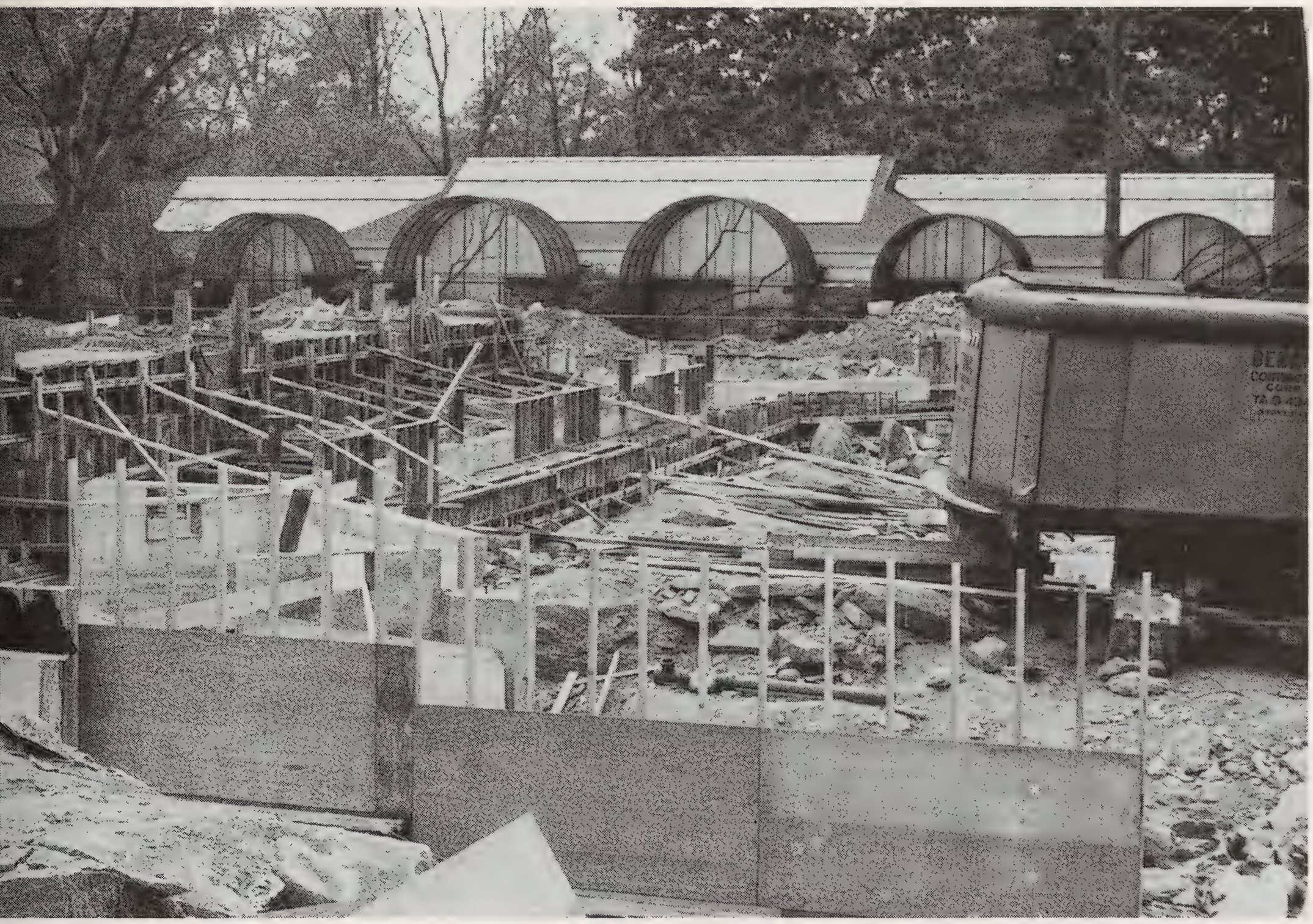
Another possession of key importance was handed down, namely, the Society's Charter. This document is as sound and as applicable today as the day it was written. Its central clause states that the Society was founded "to establish, maintain and control zoological parks, gardens, or other collections for the promotion of zoology and kindred subjects, and for the instruction and recreation of the people . . . to collect, hold, and expend funds for zoological research and publication, for the protection of wild animal life, and for kindred purposes, and to promote, form, and co-operate with other associations with similar purposes."

The foresight, breadth and flexibility expressed in this original Charter have proved to be the foundation upon which all succeeding events in

The Great Apes House should be ready for occupancy by our Gorillas, Chimpanzees and Orang-utans next June at the Members' Garden Party. The architects' conception of the building is shown above; at the right is the actual construction late this autumn.

Construction of the Conservation Exhibit appears to move slowly because such a large area — 12 acres — is involved. Another year or two may be required. Most advanced is the Casting Pool (right); various basic services are being installed in the rest of the area.







Refrigeration or at least a considerable degree of cooling is essential if we are to exhibit Antarctic Penguins the year 'round. This new building is the answer; its big, glass-fronted compartment will be kept at about 52 degrees, winter and summer. Visitors will view the Penguins from a dimly-lighted area. The building should be finished by mid-winter.



the development of the Society have appropriately rested. Our Charter has enabled us to undertake every forward step in research, in conservation and in education, to say nothing of pressing forward with the development of the Zoological Park, the operation of the Aquarium for four decades, and the making of plans for the new Aquarium, as well as many other related activities.

Turning again to the Zoological Park, it is of interest that during recent years we have made great plans for the future – a program that will in time include all those acres at our disposal that have not heretofore been developed for exhibition purposes. In addition, beyond the "borders of the Bronx" there have been projected plans for an extraordinary new Aquarium for the City of New York; the Wildlife Park and an important Biological Research Station have been established in Jackson Hole, Wyoming; a permanent station for the Tropical Research Department, under Dr. Beebe's leadership, has been established in Trinidad; field expeditions have been sent to Central and South America and to Africa. Finally, a significant rebirth of the Society's work in conservation has occurred through the creation of our sister enterprise, the Conservation Foundation.

TODAY, in the Park, we are heartened, although mildly inconvenienced, by blasting, swinging booms and pneumatic hammers, roaring bulldozers and the grinding of shovels. These disturbances herald the first new building of importance since the construction of the African Plains that occurred just prior to the war. We are rapidly completing the Great Apes House where Gorillas, Orang-utans, Chimpanzees and Gibbons will be exhibited more effectively than ever before. Nearby a charming new exhibition building will also soon be ready for occupation – the Penguin House. Up in the northeast corner of the Park the grounds for a Conservation Exhibit are being prepared, a vitally important new educational unit – a place where city people will learn of their dependence on nature. This project, by the way, marks the first instance in which the State of New York, the City of New York and the Zoological Society have entered into a three-way partnership. It is a partnership which will, we believe, prove of unique value.

Thus the Zoological Park is changing – passing into new phases that will greatly enhance its value as a teaching force. These developments are all of a piece with the Society's primary purpose of increasing the public's understanding of the world of nature.

All these things are coming about at a critical moment in human history. Preoccupied with material progress, people have been more concerned with the mechanical sciences than with those that deal with life itself. It is becoming apparent, once again, that if man is to fulfill his potential destiny, he must give thought to his relationship to nature – to his dependence upon all the forms of life that surround him. To many minds today this rebirth of an age-old concept augurs the renaissance of ethical, even spiritual progress. If this thesis is accepted, the Zoological Park of the future, or the new Aquarium, are of far greater importance than mere places where the animal life of the world is to be seen in beautiful surroundings. Such institutions are in truth centers of learning – base points for biological study, hearts from which can circulate the knowledge so necessary for people living in this mechanical age.

This, then, is our prophecy for the years ahead: that our institution can and will grow in value and esteem in proportion as it serves as a force to indicate to people that the capacity to live with themselves involves an understanding of all other living things. We shall not fulfill the terms of our franchise until we bring the meaning of our total environment to the millions of city dwellers who have lost their touch with nature. Our institution is designed to help make up for their deprivation.

These objectives cannot be attained from blueprints or buildings. They will reveal themselves through people who dare to have creative ideas and who are prepared to adopt better, clearer, more telling methods of drawing upon a great store-house of truth in order more convincingly to speak to those who come to see and learn. We are fortunate indeed in the wisdom of those before us who gave us this franchise for the future. We are enriched by the thought and effort of so many who have brought us to the point where we stand today. We are doubly grateful for the opportunity of service which lies ahead of us. Needless to say, we are committed to this service and are convinced that somehow our goals will be reached.

OLD TIMERS IN THE ZOOLOGICAL PARK

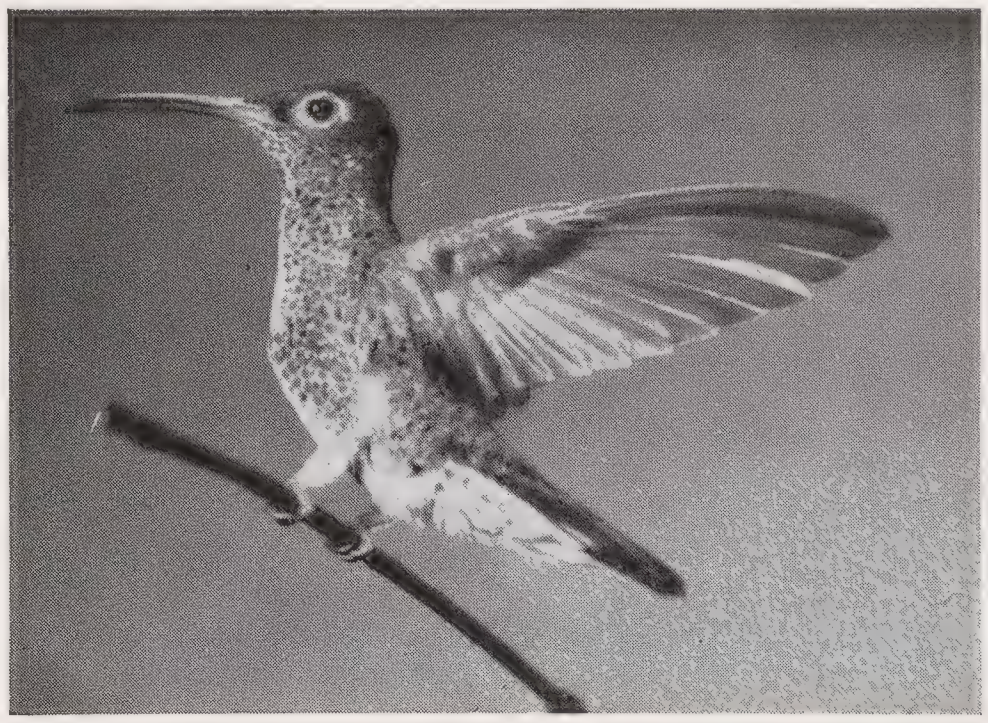
By LEE S. CRANDALL

TALES of the supposed long lives of animals are so abundant and so difficult to check, that presumably they will continue indefinitely to amaze those who hear or read them. Accurate data on the longevity of animals in nature are difficult to gather. The organized banding of young birds will eventually produce results of definite value but years of work will be required to determine the maximum spans under natural conditions. There is some reason for believing that many species may survive longer in captivity than at liberty. For this reason, if no other, it is of the greatest importance that known and well authenticated life spans of captive animals be periodically recorded.

The most important contributions made in this field are those of the late Dr. P. Chalmers Mitchell[1] (later Sir Peter Mitchell) and the late Major Stanley Flower.[2] The mass of gathered information made available by these authors must remain the basis of comparison for further records.

In the BULLETIN of the New York Zoological Society for May-June, 1935, William Bridges presented lists of twelve mammals, six birds and six reptiles which had then been in the New York Zoological Park for more than twenty years and were still living. The present purpose is to complete the histories of such of those mammals and birds as have since died and to present a further list of their successors.

It is true that setting a minimum of twenty years excludes many records of even greater comparative importance. Two of our Platypuses, received on April 26, 1947, still living on October 31, 1949, have far exceeded the forty-eight days recorded here by the only other specimen ever kept outside Australia. A Lesson's Emerald Hummingbird, received on May 18, 1944, lived with us until June 18, 1949, a period of five years and one month. This is probably the second best record for a Hummingbird in captivity, exceeded only by the eight and one-half years established in England by Mr. Alfred Ezra for a Purple Carib from the Lesser Antilles. However, present space will not permit complete listing, to which the established precedent seems the only alternative.



Lesson's Emerald Hummingbird illustrates a type of longevity records not covered by General Curator Crandall's tables in this article, but which are important nevertheless. This bird lived more than five years.

Three of the twelve mammals listed in 1935 as having lived in the New York Zoological Park for twenty years or more are still surviving. Nine have succumbed, as follows:

[1] On Longevity and Relative Viability in Mammals and Birds. *Proc. Zool. Soc. London,* 1911.

[2] Contributions to Our Knowledge of the Duration of Life in Vertebrate Animals. *Proc. Zool. Soc. London,* (Birds) 1925, (Mammals) 1931. Further Notes on the Duration of Life in Animals. *Proc. Zool. Soc. London,* 1938.

	Died	*Lived in Zoological Park*	*Records Elsewhere*
Grizzly Bear	Sept. 11, 1935	31 years 5 months	30 years (Cologne Z.G.)
Kadiak Bear	Sept. 2, 1938	30 years 11 months	23 years 8 months (Washington (D. C.) Z.G.)
Kadiak Bear	Sept. 25, 1941	34 years	23 years 8 months (Washington (D. C.) Z.G.)
Alaska Brown Bear	Mar. 23, 1936	27 years 1½ months	
Polar Bear	July 25, 1940	29 years 10 months	23 years 4 months (London Z.G.)
Indian Elephant	Aug. 27, 1943	34 years 11 months	47 years 11 months (Dresden Z.G.)
Malay Sambar Deer	Apr. 17, 1936	23 years 11 months	
Chapman's Zebra	Nov. 21, 1935	22 years 3 months	28 years 1 month (Basle Z.G.)
Grant's Zebra	Oct. 16, 1935	21 years 4 months	

Having accounted for these venerable mammals of 1935, we may proceed to their successors of 1949. But at the head of our newest list of ancients, still stand three of the stalwarts of earlier days. Curiously, all of these are Hippopotamuses, large or small. To these three survivors of the 1935 list, we are now able to add eleven new contenders for honors, so that our tabulation of "over twenty" mammals now stands at fourteen:

	Acquired	*In the Zoological Park (still living) October 31, 1949*	*Records Elsewhere*
Hippopotamus (*Hippopotamus amphibius*)	July 14, 1906 (Born in Central Park Zoo, July 13, 1903)	43 years 3½ months (Known age 46 yrs. 3½ mos.)	43 years 3 months (Amsterdam Z.G.)
Pigmy Hippopotamus (*Choeropsis liberiensis*)	July 9, 1912	37 years 3½ months	
Pigmy Hippopotamus (*Choeropsis liberiensis*)	July 9, 1912	37 years 3½ months	
Alaska Brown Bear (*Ursus gyas*)	Aug. 23, 1921	28 years 2 months	
Pigmy Hippopotamus (*Choeropsis liberiensis*)	Mar. 24, 1923 (Born in Zoological Park)	26 years 7 months	
Indian Rhinoceros (*Rhinoceros unicornis*)	May 24, 1923	26 years 5 months	"about 47 years" (Bengal, India)
Mongolian Wild Horse (*Equus przewalskii*)	June 27, 1925 (Born in Zoological Park)	24 years 4 months	29 years 57 days (Adelaide Z.G.)
Abyssinian Wild Ass (*Equus asinus taeniopus*)	June 30, 1925	24 years 4 months	
European Brown Bear (*Ursus arctos*)	Nov. 9, 1927	21 years 11 months	"about 34 years" (Vienna)
Anoa (*Anoa depressicornis*)	July 16, 1928 (Born in Zoological Park)	21 years 3½ months	12 years 9 months (Rotterdam Z.G.)
Nubian Giraffe (*Giraffa camelopardalis camelopardalis*)	Jan. 21, 1929	20 years 10 months	28 years (Antwerp Z.G.)
Malay Sambar Deer (*Cervus unicolor equinus*)	July 5, 1929	20 years 3½ months	
Kiang (*Equus hemonius hemonius*)	Aug. 20, 1929	20 years 2 months	24 years 11 months (Jardin des Plantes, Paris)
Polar Bear (*Thalarctos maritimus*)	Oct. 14, 1929	20 years ½ month	23 years 4 months (London Z.G.)

Of the six birds listed in 1935 as having lived with us for twenty years or more, none is now surviving. The completed records of these six birds are as follows:

	Died	*Lived in Zoological Park*	*Records Elsewhere*
European Pelican	Dec. 15, 1937	33 years 7½ months	48 years 11 months (Rotterdam Z.G.)
European Pelican	Nov. 10, 1944	40 years 6½ months	
Goliath Heron	Dec. 6, 1935	22 years 11½ months	
Cocoi Heron	June 1, 1947	34 years 2 months	
Cereopsis Goose	Apr. 4, 1938	28 years 7½ months	33 years (Rotterdam Z.G.)
Griffon Vulture	Feb. 19, 1944	41 years 5½ months	37 years (Copenhagen Z.G.)

Our present list of birds that have passed the two-score-years mark numbers seven individuals, as against the six of 1915. All, at the moment, seem good for many more years.

	Acquired	*In the Zoological Park (still living) October 31, 1949*	*Records Elsewhere*
Northern Eared Vulture (*Torgos tracheliotus nubicus*)	July 3, 1925	24 years 4 months	24 years
Ruppell's Vulture (*Gyps ruppellii ruppellii*)	Nov. 13, 1926	22 years 11½ months	22 years 7 months (Giza Z.G.)
Southern Caracara (*Polyborus plancus plancus*)	Mar. 3, 1928	21 years 8 months	41 years 4 months (London Z.G.)
Southern Caracara (*Polyborus plancus plancus*)	Mar. 3, 1928	21 years 8 months	41 years 4 months (London Z.G.)
Paradise Crane (*Anthropoides paradisea*)	May 31, 1928	21 years 5 months	"nearly 30 years" (Sofia Z.G.)
Greater Sulphur-crested Cockatoo (*Cacatua galerita galerita*)	May 27, 1929	20 years 5 months	56 years (Australia)
Twelve-wired Bird of Paradise (*Seleucides ignotus ignotus*)	Aug. 2, 1929	20 years 3 months	10 years 7 months (London Z.G.)

While the statistics here recorded by no means include all of the gathered data concerning the longevity of our mammals and birds, they do serve to keep check on outstanding individuals. These accounts, repeated at intervals, should make certain that none of our sturdy oldsters pass unnoticed, and that they are duly honored in zoological literature.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

Society Sponsors Conference on Pigment Cell Growth

Under the auspices of the Zoological Society, the second conference on The Biology of Normal and Atypical Pigment Cell Growth was held in the Zoological Park on November 18 and 19. Twenty-nine biologists, among them some of the leading cancer experts of the United States and England, presented papers. Dr. Myron Gordon, Geneticist at the New York Aquarium, organized the conference, and the Anna Fuller Fund gave a grant-in-aid toward its expenses.

Congratulations On Our Anniversary

Cabled congratulations on the fiftieth anniversary of the New York Zoological Park have been received by General Curator Crandall from Axel Reventlow, Director of the Copenhagen Zoo, and from Lorenz and Carl Heinrich Hagenbeck of Hamburg.

Our First Slow Loris Baby Is Coming Along Well

When the rejuvenated Small Mammal House was opened in 1947, one of its inmates was a male Common Slow Loris (*Nycticebus coucang coucang*) from the Malay Peninsula, which had arrived here in 1941. This sluggish, dark brown representative of the primitive Primates was known to be an individual of uncertain temper. Consequently, when later, in 1948, a lovely pale gray female of the Burmese form (*Nycticebus coucang cinereus*) was received, we had some doubts as to the safety of an introduction. However, the risk was finally undertaken and the complete success of the venture is evidenced by



Slow Loris Mother and Her Baby

the birth of a youngster on August 31, 1949. Hugged snugly to its mother's breast for the first few weeks, by early November it was beginning to make small excursions of its own. This is an animal not commonly bred and the youngster is the first to be born in our collection. — L.S.C.

Society Papers at AAAS Meetings

The Zoological Society will be well represented at the December 26-31 meetings in New York City of the American Association for the Advancement of Science. Ten papers will be presented or offered by title by the animal behaviorists who worked in the Zoological Park during the summer, and the Aquarium's staff will read or present by title seven papers. Dr. Ross F. Nigrelli is a member of the Reference Committee for the meetings, and John Tee-Van is a member of the Recreation and Education Committee. The Zoological Park will hold open-house for scientists attending the meetings, and their families, from December 26 through 30, and will give specially conducted tours of the collections each day at 2 P.M. during that period.

Note for November 8, 1999

Although no special celebration of the Zoological Park's fiftieth anniversary was held on Tuesday, November 8, 1949, a group of staff officers made an informal recording on the afternoon of that day, reporting on the state of the Park, its current activities and plans for the future.

Fifty years hence, on the hundredth anniversary of the Park's opening, some staff member presumably will be charged with arranging appropriate programs for the meetings of the membership, and the Fiftieth Anniversary recording should be useful. For his benefit we set down here certain technical data he may need to know: the recording was made on plastic tape, on a Brush Sound-Mirror Magnetic Tape Recorder, Model B-K 403, at a recording speed of 7½ inches a second, and the roll of tape will be found behind a suitably inscribed bronze plate in the wall of the Great Apes House now building in the Zoological Park.

Interesting New Rodents Come Into the Collection

Rodents are always welcome here, since the great diversity of habit and appearance in this group makes its members especially attractive. The latest additions to our collection are two African Crested Rats (*Lophiomys imhausi*) from Kenya. About the size of a small Cotton-tail Rabbit, the Crested Rat is coated with long black and white hair, which parts curiously along the sides of the body when the animal is excited. An unusual skull structure has caused the species to be assigned to a family of its own. — L.S.C.



A Rarity: the African Crested Rat

Our First American White Ibis Since 1918 Is Being Reared

Birds in our great Flying Cage occasionally nest, but seldom successfully. Among the youngsters actually reared were two American White Ibises in 1915 and another in 1918. Of the long hiatus between 1918 and 1948 there is little to record. This year, however, the nest of a pair



Keeper Joe Bell and the Young Ibis

of White Ibises was found to contain a downy youngster, recently hatched. That was in September. Late in October, the approach of cold weather made removal to winter quarters imperative. The youngster presented a problem of removal since, while it had not left the nest, it was well feathered. When an attempt was made to remove it, the bird fluttered against the wire netting, where it became entangled forty feet above the ground. Following its rescue by an intrepid keeper, it was removed to the Aquatic Bird House and there, in isolation, it has continued to thrive. — L.S.C.

Newcomers at the Aquarium

Two interesting species of gymnotid eels, non-electric relatives of the Electric Eel, have been received at the Aquarium from a collector just returned from British Guiana. They have never before been exhibited in the United States.

In the same collection the Aquarium received several species of unusual catfishes, a freshwater needlefish and a species of Piranha that is new to the collection. The Piranha is one of the four savage species dangerous to man.

End-of-the-Summer

Winter officially comes to the Zoological Park when the Duck-billed Platypuses are taken indoors for the winter and the King Penguins are turned out-of-doors after spending the hot days in their refrigerated compartment in the Aquatic Bird House. This year the Platypuses were taken off of exhibition on October 24, at the end of their third summer season, having been seen by 50,015 paying and 1,464 non-paying visitors since the opening of the Platypusary on May 6.

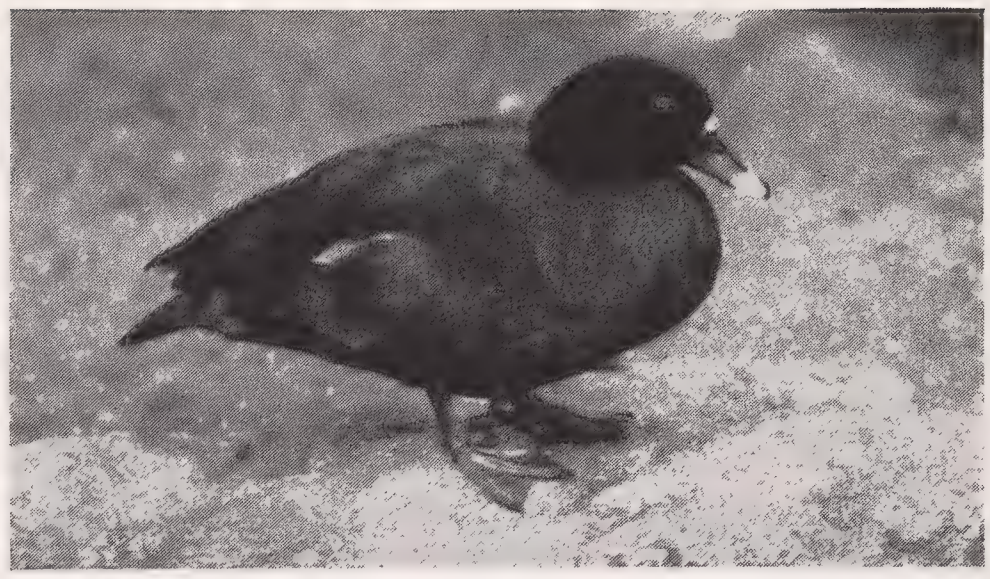
The Children's Zoo closed for the season on Sunday, November 13, with a season attendance of about 320,000. The Farm-in-the-Zoo and Question House closed on the same date with 60,527 and 33,500 visitors, respectively.

* * *

A few weeks ago the New York *Times* reported the efforts of Cyrus S. Ching, director of the Federal Mediation and Conciliation Service, to end a walkout of dock workers in Hawaii. At the end of the article the newspaper quoted Mr. Ching as saying he expected to visit the Bronx Zoo that day. "With no reflection on the people I have been talking with," he said, "I am just a little tired of the human race."

Now We Exhibit Some of Africa's Rarest Ducks

Among the many rarities brought from the Congo by Charles and Emy Cordier were three specimens of Hartlaub's Duck. Long sought by



Hartlaub's Duck — a Congo First-timer

collectors and breeders of waterfowl, these appear to be the first examples to have been kept in captivity. It is an unusually handsome species, the rich chestnut of the body plumage being set off by the bright blue of the wing coverts. The systematic position of Hartlaub's Duck has been the subject of much conjecture, the last word (Delacour and Mayr) assigning it to *Cairina*, along with the Muscovy and the White-winged Wood Duck. Tree-perching habits, long tail and a forward pitch in walking seem to support this opinion. — L.S.C.

* * *

November 8, the fiftieth anniversary of the opening of the Zoological Park, was made memorable to the Bird Department by the receipt by air from London of two magnificent specimens of the Greater Bird of Paradise. They are the first that have come into the United States since before the war, are adult, and are in perfect plumage.

New Members of the New York Zoological Society

Between September 1 and October 31

Contributing

Philip R. Allen
J. Ainslie Bear
Stewart S. Hathaway
Mrs. Gustav H. Lamm
Bertram H. Saunders
Milo Waldes

Annual

Alan Bendiner
Alfred Burghardt
Mrs. Marta P. Campbell
Thomas Hyde Clarke
Mrs. Laura G. Currie
Charles M. Fitch
Guy George Gabrielson, Jr.
John Davidson Gould
Woolf Paul Gross
Dr. Richard H. Hoffmann
Kenneth Hubley
Miss Rosemary Kenedy
Walter J. Lennon
Robert Levenson
Bertram Litt
Robert W. Morgan
Allen Law Morris, Jr.
John V. Quaranta
Mason D. Salisbury
Miss Nancy Constance Snider
Joseph Sonnenfeld
Dr. Edward Vastola
Konrad Von Eiff
Dwight Winter
Mrs. J. D. Wolff

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NEW YORK ZOOLOGICAL SOCIETY

VOLUME LIII

JANUARY TO DECEMBER, 1950

NUMBERS 1–6

INSTRUCTIONS TO BINDER

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ANIMAL KINGDOM



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Orienting Ourselves

FOR ABOUT 150 years prior to the beginning of this century an intellectual movement was in progress which in many respects was one of the most revolutionary in all human history. This movement resulted in the creation of an immense structure of knowledge; in effect, the establishment of the biological sciences. It culminated in the pronouncement of Charles Darwin's theory of evolution. The impact of this upon men's minds was far greater than any of us today can realize. Several decades were to pass before its general acceptance. In effect, the Darwinian Theory proved that man was an integral part of nature itself, and not a separate and independent being.

Soon after the commencement of the present century, however, powerful counterforces came into play. They have gone far toward blinding man's eyes to his essential dependence upon nature and have definitely influenced present-day philosophy and our general outlook on life. These counterforces have developed from the extraordinary advances that have been made in the mathematical and physical sciences, which, among other things, have produced innumerable inventions that have enabled man to master the air, to use radar, and even atomic power. As a result, we are apt to be tricked into believing that we are "the masters of the universe" and to overlook, if not forget, our essentiality and oneness with the natural world.

It is curious that the inviolability of the workings of the natural laws should need defenders in this day and age. The human mind throughout the ages has recognized the meaning and power of nature. Lao-Tse wrote in the sixth century before Christ, "Nature . . . makes all things serve her purpose." We can recall Sir Thomas Browne's observation in his *Religio Medici*: "Nature does nothing in vain"; or, Montaigne's words, "Nature can do all and doth all"; he also remarked, "Oh senceless man, who cannot possibly make a worme and yet will make Gods by the dozens"; and Milton, who said, "Accuse not nature! She hath done her part; do thou but thine!"

We all recognize that the word, "nature," is one of the broadest in our language. We can well think of it as referring not merely to the scheme of the universe, but to the sum total of conditions and principles which influence, indeed govern, the existence of all living things – man included. One barely needs to add that animals, in their myriad forms, are dynamic expressions of nature's processes.

In the light of such considerations we can measure the opportunities that lie before our institution.

Fairfield Osborn

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FEB 10 1950



This is the Long-wattled Umbrella Bird, the first specimen (a male) captured by Charles Cordier on the western slope of the Andes in Ecuador. It is a puzzle how the bird can maneuver rapidly in a thick tropical forest with such a cumbersome appendage as this foot-long feathered wattle.

FIRST PRIZE

from the Ecuadorean Andes

By WILLIAM BRIDGES

ONE OF THE CHARACTERISTICS of Charles Cordier, our animal collector, is that when things are going well he doesn't write letters. We have, for instance, never been so well informed about the progress of one of his collecting trips as when he was handicapped by a broken leg in the Belgian Congo.

So it is an auspicious circumstance of his present search for rarities in Ecuador that we have received only three letters from him since he and Mrs. Cordier sailed from New York on October 2. His silence means plenty of hard work and success — but it also means that we have very few details of one of his greatest collecting triumphs. For Charles has captured four specimens of the Long-wattled Umbrella Bird, *Cephalopterus ornatus penduliger,* the most spectacular never-before-exhibited bird in South America.

In the months between the Cordiers' arrival from the Congo on June 15 and the decision to try Ecuador next, Charles and General Curator Crandall systematically studied the bird and mammal possibilities of Central America and northern South America. They settled on Ecuador largely because Charles wanted to make a try for the two Andean forms of the Umbrella Bird that nobody had ever exhibited alive. He had introduced one of the three known forms to the world in 1942 when he brought out the Bare-throated Umbrella Bird, *Cephalopterus ornatus glabricollis,* of Costa Rica and western Panama. Two fine specimens, a male and a female, are living in our Bird House now. Probably his sense of fitness (and certainly Mr. Crandall's curatorial cupidity!) urged that we carry on from the start made in 1942 and be the first to exhibit, individually and simultaneously, all three kinds.

The eastern slope of the Andes, where it drops steeply down to the Amazonian jungle, is the home of one form, the eastern Umbrella Bird, *Cephalopterus ornatus ornatus;* it has quite a wide range that includes western Brazil and the upper Orinoco to the eastern base of the Andes of Colombia and Ecuador, eastern Peru and Bolivia. It has a reasonably imposing wattle, or appendage under the throat, apparently fully covered by feathers, and this wattle is recorded as about 6 inches long.

But the First Prize, the Umbrella Bird that Charles was determined to get — and which he *has* caught — is the Long-wattled Umbrella Bird, *Cephalopterus ornatus penduliger,* of the western side of the Andes in Ecuador and Colombia. Its wattle truly justifies its common name, for it is nearly 14 inches long when extended by the bird's volition — we do not know whether it is extended and contracted by musculature, air or what — and the fleshy appendage is completely covered by overlapping, iridescence-tipped black feathers.

Well, now that he has four specimens of the Long-wattled, at this moment he is ranging the eastern slopes of the mountains in search of the



In 1942 Charles Cordier captured specimens of the Bare-throated Umbrella Bird in Costa Rica and brought them to the Bronx Zoo—the first ever exhibited. This is a pair now on display in the Bird House. The bare throat of the male is bright red and it bears a short fleshy wattle.

only slightly less spectacular eastern Umbrella Bird. Our guess is that he will get it, too.

Only the sketchiest kind of a story of how he caught the Penduliger (Charles uses the subspecific name as a common name), can be extracted from his infrequent letters to General Curator Crandall. Here is his account of the capture of Penduliger No. 1. The letter is dated Quito, Ecuador, November 18.

"Up to now we have one Penduliger which we

The Cordiers lived in a tent while hunting the Umbrella Bird this past fall. Until the rains set in, it was comparatively comfortable, with even a shower bath in the hut at the left.

The expedition's base in Quito is really luxurious, however; there are two buildings in a walled enclosure and the Cordiers live in the smaller house, reserving the large one for animals.



Our last Long-wattled Umbrella Bird was netted in the top of the broad-spreading wild fig tree in the center of this photograph, at a height of 130 feet from the ground. Twenty-four hours later, woodcutters chopped down the tree while clearing the land for a plantation.

brought to our Quito base on November 10 after an all-night drive up the mountain road. Since then I have hurried to make a large cage for it so its foot-long wattle won't suffer. As a matter of fact, the wattle is only about half as long when the bird is at rest.

"Capturing that single specimen has been a mad rush against the oncoming rainy season. The first few days in the foothills were comparatively dry and whenever the sun was shining hard, which did happen every second or third day, the birds would come down from the treetops, occasionally to 50, even 30, feet for a few minutes. At all other times they stay at 150 feet and higher. Observing them was like gaping at the Empire State Building. I had a perennial pain in the neck from staring straight up. Our Penduliger was caught 140 feet in the air.

"If the preposition 'if' had not been invented we would now have at least three Penduliger males, but we simply had to leave that camp because of incessant rain and drizzle lasting sometimes five days without letup. Everything, including ourselves, was getting mouldy.

"One of the specimens we missed fell into my 1941-vintage net made in Costa Rica. He formed a nice pocket, struggled a bit, tore one thread and dropped out again. On another occasion I had a location where two males used to visit once a day for a few minutes to feed on some small fruit of a Passiflora vine. I had the place nicely surrounded by all available nets. As the 'visiting hour' came crawling near I saw my two intended victims in the center of one of the nets studying a Toucanet that had been caught. Never did they come back to the location."

But a little more than a month later, on December 22, Charles was able to report better luck and to give a few details of subsequent captures. His letter accompanied the photographs which illustrate this article.

"One of the pictures (page 6) shows the tree the last Long-wattled Umbrella Bird came out of — a wild fig tree which hours later was cut down as the ground was being cleared for a banana plantation.

"The bird came to that tree at 5:30 P.M., fed, slept in it, drummed with his wings a few times at 5:45 or 5:50 A.M., then boomed for a few minutes, fed, boomed some more and raced back and forth on his favorite branches, displaying his enormous wattle to a visiting female which remained unresponsive to his charms. She made off after a few minutes. By 6:10 A.M. the whole show was off, everything quiet, with no Umbrella Birds in sight. Then at 7 A.M. the woodcutters started on their work nearby.

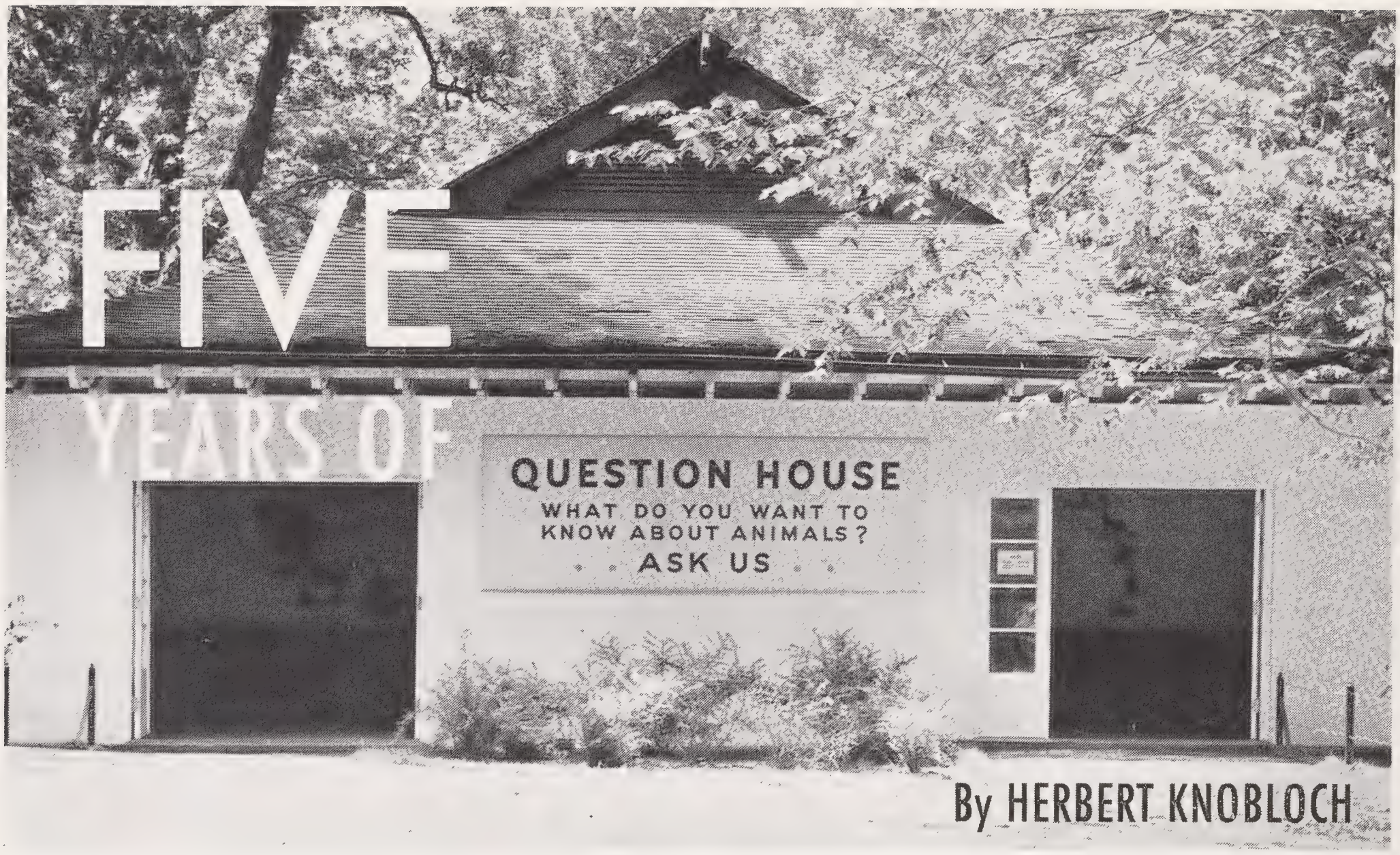
"The following morning when he darted from his favorite perch to plunk himself down on one about twenty feet distant, he perceived in time a net that had been placed there at my initiative. He had time to make a complete left turn before colliding with the net. After that there were a few tense seconds, or minutes, as you can imagine. Back on his first perch he started to boom as if in anger. He seemed to work himself up into a frenzy. Anyway, on the second jump he forgot all about the net and tore into it with a will, then hung there in a pocket. All this happened at 130 feet."

MRS. CORDIER'S job on collecting trips is to operate the home base and take care of the birds and mammals her husband captures. One letter from her, dated at Quito on December 6, adds a few fragments to the story of Penduliger No. 1.

"The Umbrella Bird, which I named 'Torito,' is lovely now and tame. He is getting a sun bath every day when I move the big cage out into the sun. I have to talk to him constantly so he does not get scared. He starts singing as early as 6 A.M., sometimes in the middle of the night. It sounds like a bull grunting, from far away, but when close I hear first a sound like an electric switch going on; that is when he inhales.

"His wattle, *carleata* as they call it here, gets as long as twelve inches. Sometimes he picks it up in his beak and shakes his head. He has brilliant, intelligent eyes and looks from side to side when I talk to him."

The Cordiers and their Ecuadorean collection will return to New York sometime next May, according to present plans, in time to exhibit the First Prize of the Ecuadorean Andes at the spring Members' Garden Party at the Zoological Park.



FIVE YEARS OF QUESTION HOUSE

By HERBERT KNOBLOCH

When the Question House closed its doors for the winter on November 13 it had completed its fifth year of service to the public and was, therefore, just one-tenth as old as the Zoological Park. It cannot claim to have answered one-tenth of the questions asked about wild animal life or about the Zoological Park in the past fifty years; at best it has been able merely to take some of the pressure off the Zoological Park's animal departments during the busiest seasons.

It is a curious fact that people's appetites for authentic information about animal life is insatiable. The more it is fed the hungrier it becomes. Who answered animal questions before Question House existed? We know, of course, that the Zoological Park has been a clearing house for all sorts of zoological information since its earliest days; over the years the mammal, bird and reptile departments have spent a vast number of hours answering queries by telephone, by mail and by personal interview. Today, although Question House answered 13,316 inquiries in 1949 and a total of 56,754 since it opened its doors five years ago, the stream of questions flowing into the animal departments has not slacked off to any great extent. Those departments do not keep statistics on their questions, so it is impossible to formalize the situation "Before Question House" and "After Question House." Nevertheless, all of us have the impression that the General Curator's telephone rings just about as often and as insistently today as it did before Question House was more than a gleam in President Osborn's eye. Question House, it appears, is simply creating a new demand for information, or perhaps giving an old and unsatisfied demand an outlet by reason of its accessibility in the very center of the Zoo.

Looking back over the past five years there are a few conclusions we can draw about the types of questions that people ask, and about the kind of people who ask them. By and large, the questioners are about evenly divided between adults and children; week-days bring school classes into Question House in droves, holidays and Sundays produce proportionately more adults.

The kind of question that stands out above all others is the summary one: "What is the biggest (or fastest, or strongest or most dangerous) animal?" As everyone knows who has had much experience in answering questions about animals, it is never safe to be dogmatic. The best one can do it is to report the best available records and authenticated observations.

Certainly second in popularity are questions about the care and feeding of wild animal pets. Pets tend to run in fairly familiar channels – squirrels, snakes, tortoises, skunks, frogs, fish, hawks and the like – but still there seem to be a good many problems that their young keepers haven't solved about their diet and living quarters and diseases; we have had to call many times on the animal and veterinary departments for special information when some youngster was faced by an emergency in his home menagerie and put the problem up to Question House. Hamsters and white rabbits and guinea pigs no longer hold many terrors for the Question House staff; it seemed long ago that we had answered *all* the questions about those three animals that could ever conceivably be asked!

Without encouragement, and in truth in the face of all the discouragement we could present, living animals are occasionally brought into Question House for identification. A small boy carrying a shoebox, a glass jar, a tin can or even a sagging handkerchief is pretty likely to be transporting some (to him) mysterious object that Question House is required to identify. The job behind Question House desk is, obviously, no place for anyone squeamish about snakes, spiders, frogs and sick birds! Last year one of our visitors with a "What is it?" question happened to be carrying the larva of a Tiger Swallowtail Butterfly in the exact stage of its development when it was most photogenic; our staff photographer took pictures of the creature, and one of them made an exceptionally striking cover picture for ANIMAL KINGDOM.

Veterans have found out about Question House and we get a surprisingly large number of inquiries from men who have more or less definite recollections of creatures they saw in far parts of the world and who would now like to have their recollections checked. We do the best we can, but it is discouraging business when the man knows merely that he saw it in the New Guinea jungles, and can't be sure whether it had hair, feathers *or* scales.

On the theory that Question House's job is to



Question House is a boon to parents baffled by their children's inquiries about animal life and scenes like this are repeated many times a day. Children often seem to have stored up questions from their reading of juvenile books on natural history, and their questions are concrete.

answer questions as honestly and fully as possible, we do not back off from the realm of myth, even though more often than not it is a fruitless and thankless task to attempt to destroy the fantastic untruths that so many people believe. The Question House staff will not soon forget its session with an up-State New Yorker who wanted to know whether we would support his life-long belief that it was dangerous to go swimming in country creeks after the month of May because Copperhead snakes were apt, at that time of the summer, to be rolling on the bottom after shedding their skins. It was easier to convince a boy that "Swamp Rabbits" did not habitually swim on their backs, using their ears as oars – even though his grandfather had told him that tale. On the more difficult side was the reported "fact" that venomous snakes spit out their venom in a ball before drinking, swallowing the poison again when they have slaked their thirst. Sometimes a more enlightened member of the family helps us out – as, for example, in the instance of a man who wanted to know whether a cow would die if she "lost her cud." His wife professed to know nothing at all about cows and cuds, but she had the common sense to point out that if cows lost their cuds and died as frequently as her husband thought they did, the price of milk would be even higher than it is!

ONE THING IS CERTAIN: by far the greater number of questions come from people honestly interested in getting information rather than in "stumping the experts." Nevertheless seriously-asked but unanswerable questions do occur – such as "Exactly where and when did the last Mammoth die?" When a reasonable answer cannot be given, we say so and explain why.

The sources of the inquiries directed at Question House, no less than the timing of questions, follow a predictable pattern. The staple of "off the premises" inquiries – those that come by telephone and mail – stem from newspapers, magazines, radio stations, advertising agencies, authors, artists, doctors, architects; in other words, from professional sources. Periodically there is a spate of questions from crossword puzzle and rebus contest addicts. A picture or article about some queer new animal in the daily newspapers is sure to be reflected over the counter in Question House; dozens or even hundreds of people want to know more about the creature. A major article about a new arrival at the Zoological Park of course brings a vast number of inquiries.

Before the arrival of the Duck-billed Platypuses in 1947 the Elephant was the most popular animal in the Zoo, at least on the basis of the number of inquiries about it. Snakes ran a close second. Now the Platypuses are far in the lead with no fewer than 4,102 questions about them.

Incidentally, the word "Platypus" seems to be a hard one for the American tongue. We have heard the animal referred to as the Flatypus, Patapus, Platybus, Bladypus, Puss, Giant Platy, Palatable Puss, Clatapus, Palabus, Palable Puss, Platyblus, Catapus, Clababus, Platiyepus, Platapazuss, Papoose, Duckless Platypus, Patipus and Pollypus. In conversation they have been called birds, lizards, cats, ducks, fish, crocodiles and alligators. One child wanted to know if they were cats, because the name ended in "puss." When she was informed that they were not cats and that, among other things, they ate worms, she nodded: "Oh, I see – they are chickens!" A much-travelled woman asked the name of the "rare animals" in the exhibit across the road from the Question House. We told her they were Duck-billed Platypuses. "But *they* aren't rare – I used to see them flying over Borneo," she exclaimed. We don't know yet what she thought she used to see "flying over Borneo."

So varied are the questions that come to the desk of Question House that one might conceivably gain a good general education in zoology – at least in popular zoology – by merely standing and listening. Indeed, some visitors do just that; they come in, ask a question themselves, and then stay, fascinated, for half an hour or so to hear other inquiries and the answers.

One thing *we* have learned about in the past five years – the wiles of children. At first we were delighted when a youngster strolled in and with the eager enthusiasm of his age began to fire questions with machine gun rapidity. We congratulated ourselves on this opportunity to help a little mind unfold. Over the years we learned that the thirst for information was not always disinterested. Often we were just an easy way of doing homework!

Counterfeit Terror

By EDWARD A. ARMSTRONG

The author of "Bird Display" makes some observations on the curious phenomenon of injury-simulation in birds.

ALARM a wild duck with her flotilla of ducklings and she may go into a paroxysm of activity, threshing the water with her wings and sprawling about in a helpless way, or disturb a Killdeer Plover from her chipping eggs and she goes fluttering over the ground with one wing waving limply. She may even collapse spread-eagled as if she were at the last gasp. If, however, you approach such an injury-simulating bird it always manages to flutter out of reach, and when you have been led many yards from the eggs or chicks the bird flies up and away.

From very early times such performances have interested and puzzled those who witnessed them. Aristotle called attention to them and probably the remark of the younger Pliny that quail are subject to epileptic fits was based on a misinterpretation of the behavior of injury-simulating birds. The late English Poet Laureate Robert Bridges wrote in *The Testament of Beauty*:

It is pretty to mark
a partridge, when she hath first led forth her brood to run
among the grass-tussocks or hay-stubbles of June,
if man or beast approach them, how to usurp regard
she counterfeiteth the terror of a wounded bird
draggling a broken wing, and noisily enticeth
or provoketh the foe to follow her in a vain chase;
nor wil she desist from the ruse of her courage
to effect her own escape in loud masterful flight,
until she hav far decoy'd hunter or blundering hoof
from where she has bid her little ones to scatter and hide.

What is the explanation of this kind of performance, characteristic of birds of many species? Before endeavoring to answer this question it is necessary to consider the circumstances in which it is elicited. It is noteworthy that it is practically confined to birds and is not recorded of any purely aquatic creature, nor is it known among insects or reptiles. A few naturalists, among them W. H. Hudson, have referred to deer making off with a limping gait but it is doubtful whether any such instances can be regarded as injury-simulation or injury-feigning in the sense in which we use these terms of birds. Even among birds there are striking exceptions. They are of special interest as they provide clues to the real nature and function of this form of distraction display. Apart from the Ostrich, such behavior seems to be unknown among flightless birds such as the Penguins and Kiwi and there is no record of a Great Auk acting thus when men approached to take the egg. This suggests that injury-simulation brings the performer into too great jeopardy unless he or she can escape quickly out of reach by becoming air-borne. It might be argued that what matters is rather that the eggs or young should be saved from destruction and that what happens to one of the parents is of secondary importance, but among most species of birds the help of both parents is necessary at some stage in the rearing of the young. If parents acted in a way which rendered them unduly vulnerable the species would be menaced by extermination.

Thus the answer to the question why injury-simulation should be restricted, or almost re-

Photographs Copyright by E. A. Armstrong, St. Mark's Vicarage, Cambridge, England.



The eggs of the Ringed Plover are buffy white or cream with chocolate-colored specks or spots. They are generally laid on sandy, pebbled beaches and blend perfectly with the ground.

stricted, to birds, is that they are the only considerable group of organisms in which parents are likely to be near their offspring to deal with the situation when predators approach, and these same parents possess, in most cases, a capacity for escape into another element. One would not expect to find injury-simulation behavior among bats, for instance, because they carry their young with them, nor among flying fish, for they would not thereby protect their progeny, and there are usually obvious reasons why it should not occur among any of the relatively few insects in which there is some approximation to parental care, such as earwigs or hive bees.

Examining the situation further we find that injury-simulation is extremely rare among species nesting in lofty trees but it is common and often highly realistic among birds breeding in very open situations — such species as the Killdeer in North America, the Dotterel, Golden and Ringed Plovers in Europe and the Banded Dotterel in New Zealand. This can mean only one thing—the elimination by predators of inefficient performers and their offspring has operated so that injury-simulation has been brought to a high degree of realism among species much exposed to the attack of ground enemies.

A further qualification may be made. Although injury-simulation is widespread among birds it is uncommon among species which nest in closely-packed colonies. For instance, murres, gulls and terns do not show this form of behavior. There are exceptions, such as pratincoles and avocets, some species of stilt, and black skimmers. These birds are rather exceptional in their feeding behavior and one suspects that their community nesting may be a comparatively recent development, as time is reckoned in evolution, and the birds have not yet discarded a type of behavior which has much less survival value in crowded colonies than when performed by birds nesting in isolation. A small mammal having found his way among numerous nests is not likely to be lured away by the antics of several frantic birds

sprawling or fluttering near at hand. As is well known, birds nesting in close colonies rely on mobbing to drive away or distract the attention of enemies rather than on injury-simulation.

Thus from one point of view we may say that this form of display is the outcome of natural selection, but we must now ask how it is to be explained on the basis of our present knowledge of bird psychology. An observer who has not studied bird behavior closely is apt to think when he sees the very realistic performance of a Killdeer or Golden Plover that the imitation of injury or incapacity is deliberate and therefore due to "intelligence." But when we see a stick insect mimicking a twig we do not consider the creature "clever." We realize that the adaptation has come about through the elimination of individuals which were too conspicuous. In short, the adaptations of bird and insect are due to natural selection. It is possible, indeed, to demonstrate the unintelligent nature of the injury-simulation of a bird such as the Ringed Plover. One may frighten it again and again. Each time it will limp and flutter away as if crippled, and then, suddenly give itself a shake and walk back to brood its eggs within a foot or two of one's face. Indeed, I have known a bird after injury-feigning to allow me to put my fingers under its breast.

Such behavior in which the impulse to flee and and the impulse to brood alternately dominate suggests that injury-simulation behavior is a product of the clash of the two incompatible impulses. This theory, however, only takes us a short distance in explaining the evolution of these remarkable performances, but if we enquire what happens in other circumstances when there is a conflict of impulses or an impulse is thwarted we gain light on our problem. In such a situation a bird usually performs some irrelevant action; a gesture or item of behavior from one type of situation is performed incongruously in quite another type of situation. I have suggested that such items of behavior or "behavior-patterns" performed "out of context" should be called "displacement activities," as they are activities transposed from their normal setting. Thus a thwarted house sparrow wipes its bill and a mouse unable to escape from a cage will clean itself. Now, it is in situations when a bird is frightened at the nest or prevented from brooding that such activities are commonly performed. In interludes between injury-simulation a Ringed Plover will preen, peck at the ground as if feeding, but without seizing anything, or settle as if brooding in a hollow among the pebbles. The fact that such displacement activities are so often associated with injury-simulation raises the question, "Is this form of behavior also a displacement activity?" As it is never enacted except in this type of situation it is obviously not transposed from another context and it would seem that the answer must be in the negative. But there is another explanation which I believe may be the solution of our problem. I suggest that injury-simulation displays have incorporated movement patterns from other contexts, such as threat behavior or courtship — varying, of course, according to the species. Thus nighthawks open wide their huge gapes while simulating injury, behavior which is essentially threat display. The Killdeer's injury-simulation display appears to be a modification of the threat attitude in which the bird partly spreads its

Here the female Ringed Plover is settling down on her nest on the beach while the male stands guard a short distance away.





The Ringed Plover sometimes performs a threat display before an injury-simulation.

The bird has left the nest and is about to "injury feign" with an attitude like threat.

▼





The female simulates injury; she creeps from the nest with her wing flopping as if broken.

wings, flexed with the upper surface toward the intruder. This plover, and several other species of plover, spread the tail during threat or courtship display and also in their distraction display. Thus it seems that injury-simulation incorporates forms of display displaced and modified from other situations.

This theory might seem far-fetched but that we know that this is exactly what has happened with other forms of display. The Gray Heron's display, signifying that he is ready to welcome a female to his territory among the branches, is a modified form of the gesture he makes in catching food. The pigeon, and some other birds, make preening motions during courtship, and various species of duck have incorporated a drinking gesture into their sexual display, as Konrad Lorenz has demonstrated. Thus we know that displacement activities may become stereotyped in their new behavior context and become innate forms of display behavior. Probably injury-simulation owes its evolution similarly to modifications of items of behavior from other contexts.

Field naturalists will find it worth while to scrutinize any injury-simulating birds they happen to come across with these possibilities in mind. I believe that the more closely these displays are studied the more clearly it will appear that they incorporate activities from other behavior contexts.



This female Ringed Plover is putting on a good act as an injured bird. Flushed from her nest, she hobbles and limps away with one wing being waved conspicuously and the other held as if broken. Photographs such as this are extremely difficult to obtain and few have been made that are as fully illustrative of the various threat display and injury-simulation actions as these. Photos by the author.



Although females of most birds are especially famous for the injury-simulation act, here it is the male Ringed Plover that is crouching in the open near the nest, as if to brood or hide.



Derby's Woolly Opossum posed rather unconventionally for this photograph, with its tail in a rakish attitude across its head. This little animal comes from Peru and Ecuador northward to Central America. Its normally pink ears turn a rose color when it is annoyed or gets excited.

Album Pages

Photographs by Sam Dunton



A very rare bird is the Double-banded Giant Cacique of northeastern Brazil—so rare that only once before has it been exhibited. That was in 1915-1933 when a specimen lived in our collection. It is a forest bird, related to the Montezuma Giant Cacique, largest of all the Orioles.



The graceful and sure-footed motions of a pair of Squirrel Monkeys from South America are revealed by this photograph taken at high speed by a stroboscopic light. In their large compartment in our Small Mammal House, as in the wild, they seem to be constantly making flying leaps.



"Princeton" is the largest of the three cubs born to "Dacca," our superb Tiger mother, on May 6, 1949. He was just five months old when this portrait was made and about three weeks later he weighed 89 pounds. All three of the young Tigers are friendly and good-natured.



Usually the only time it is possible to photograph a Yellow-footed Marsupial Mouse is when the female is hampered in her movements by her babies. These "joeys" were about 8 weeks old.

Australia's Yellow-footed Marsupial Mouse

By DAVID FLEAY

In times that are now long gone I camped one autumn night with a cobber in the tin-roofed, hessian-sided store hut of a bush apiary. It was the only structure for miles on the "Stony Rises" property of Mr. Jim Anderson, between Smeaton and Campbelltown, central Victoria, Australia, and stood among outcropping masses of basalt and spreading, yellow box eucalypts. Our aim was the capture of a Brush-tailed Tuan, that handsome, alert and dashing marsupial hunter — a specimen of which had been in the habit of burgling the hut for honey.

The "Bee bloke" — as our absent host was familiarly known in the district — had gone to great lengths to make his storehouse proof against pilfering by furry bandits, and the only light penetrating the interior came through a narrow strip of fly screen encircling the hut immediately under the roof. However there was a newly broken hole in this band, with clinging tell-tale hairs.

Throughout the night we dozed and watched but the darkness passed and it seemed that the vigil had been in vain. Suddenly, in the dim gray light of dawn, a sharp-nosed, wide-eared face appeared on the outside of the screen, and with characteristic quick, jerky movements there entered the hut through the obviously familiar

All photographs from David Fleay, Badger Creek, Healesville, Victoria, Australia.

entrance hole not our long-expected Tuan — but a Yellow-footed Bush Mouse, one of its smaller and very handsome relatives. This first sight of an animal new to us was the signal for a quick plugging of the hole and the start of a lively chase. Ten minutes later, however, we gazed in despair at a mass of overturned boxes, tins and spare hives in which there was not the slightest sign of our visitor. Following several lightning-like journeys 'round the bag walls of the hut, the little marsupial had departed even more suddenly than it had come. Nevertheless, some days later we caught "him" in a curious and totally unexpected manner. It turned out that he and a fellow "mouse" were dwelling in an empty hive near the hut. They gave themselves away by characteristic quarreling notes of "chit — chit — chit — chit" such as we hear today from Swainson's Pouched Mice living in the walls of our bush home at Badger Creek, and all we had to do was to push a large cork into the front "doorway."

The first bush "mouse" of this genus that I ever met joined my collection under much more unusual circumstances. It was a very hot day, and wandering through the bush near Ballarat I came to a curious little hollow tree on the crest of a long, low range. Down a deep crack in the trunk the dim, quickly-breathing form of a mouse-like creature could be seen, but how to reach it in the absence of a hatchet was a difficult problem. Suddenly I had the bright idea of making use of a Copper-head Snake which had been bagged several hours earlier. The reptile was introduced head first into the hole and suspended by the tail. Though this occurred 26 years ago I can still picture the amazing activity of the frightened Swainson's "mouse" as it shot from the nest and spiralled round the trunk, eventually being secured by a lucky grab!

Among the lesser pouched animals the Yellow-footed Pouched Mouse (*Antechinus flavipes*) is practically unknown to the ordinary observer, but it merits interest and admiration because of its keen, alert bearing, warm russet-colored fur, amazing rapidity of movement and unique zoological standing.

With male specimens attaining the size of a half-grown rat, i.e., up to 8 inches in length from nose to tail tip, and females from half to three-quarters the size of the more robust sex, this representative of the broad-footed pouched mice is remarkably variable in measurement. It is a sharp-nosed, keen-scented seeker of insects, nectar, small birds, little lizards and particularly of



A close relative of the "Yellow-foot" is Swainson's Pouched Mouse, smaller and more chocolate or reddish in color. The rain forests of southern Victoria and Tasmania are its habitat.

common mice, wherever it can find them. Skins of these rodent pests are usually so thoroughly cleaned up that the peeled skin is left turned inside out.

Whereas the smaller chocolate or reddish brown Swainson's Pouched Mouse (*A. swainsonii*) favors the rain forests of southern Victoria and Tasmania, the yellow-footed species takes over among sparsely timbered granite ranges or basalt country north of the divide in Victoria. It also favors the sandy box ridges of Murray river areas, the Sydney sandstone outcrops, and ranges widely over mainland Australia. In secluded hollow limbs, or hidden rock crannies in such habitats, it builds a large nest of eucalypt leaves arranged in a circular manner and packed neatly on the long edges, like cards, to enclose a central cup-shaped resting place.

With such a wide range over mainland Australia, though not occurring in Tasmania or New Guinea, it is scarcely surprising to find that its general color is, like its size, somewhat variable. Apart from the typical species a North Queensland, a South Australian and a West Australian race are recognized. In all of them the buff or yellowish tone of the broad feet is fairly constant. Victorian examples are of a general warm gray suffused with yellow above, with head and neck conspicuously gray. The ventral surface is yellowish to rufous, feet yellow, with sides of body rufous or a golden tan. The tail, which is shorter than the combined head and body, is covered uniformly with close stiff hair, rufous below and colored above like the dorsal body surface. With the typical widely-opening jaws of a predatory mammal, and dentition resembling on a small scale that of its relative, the native cat (Dasyure), the Yellow-foot is capable of vigorous biting, and male specimens draw blood readily if unwisely handled. The ridged foot pads and long claws, which assist them to climb so agilely about trees and rocky places, also enable the animals to run practically upside down over the roofs of rock caverns.

Particular attention has been directed to the Yellow-footed Marsupial Mouse by Professor Wood-Jones who pointed out that its special interest from a zoological point of view lies in its representation of a marsupial base form. In the whole of its anatomy it shows itself to be a remarkably generalized animal, but little modified from a basal mammalian plan that could be considered ancestral to most of the marsupial radiations that gave us the hopping, climbing, parachuting, digging, hunting and even aquatic forms. It is unfortunate indeed that the Yellow-footed Bush Mouse is such a simple, trusting creature, lacking any great degree of cunning or proper appreciation of danger, for as a destroyer of cockroaches and other harmful insects it has few equals. It becomes too intent on hunting activities in the presence of prey, and I well remember an early dawn in the Daylesford district of Victoria, when, hearing a commotion among roosting sparrows and observing fluttering wings in roof guttering, I reached up and pulled down a sparrow with a Yellow-footed Mouse attached. Oblivious to all else, the attacker persisted in its bulldog grip even when I carried it away! It is not difficult to lure the animals into box traps baited with honey-soaked bread or pieces of meat while watching from nearby.

Domestic cats and the common fox have been responsible for clearing the Yellow-footed Bush Mouse from many of its former haunts and it is unfortunately true that wherever settlements spread, the doom of this little animal and others like it appears to be merely a matter of time — unless, of course, netted-in areas are established in suitable country, with sufficient staff to control marauders. In a few short years I have noted its final disappearance from areas where formerly it was possible to watch it running, a few feet at a time, along sun bleached logs, stopping with a characteristic jerk and as quickly moving sideways or forward, or circling a tree trunk in its inimitable style. Nocturnal and crepuscular, Bush Mice often investigated our camps and in the dusk or very early morning it was no uncommon thing to see the hind-quarters and tail of a busy Yellow-foot projecting from an open jam tin among the scattered provisions.

The method of carrying and caring for young is of exceptional interest, for, following the general rule that the smaller the marsupial the greater the size of its brood, the Yellow-foot in Victoria, at least, takes the palm for large families; and though textbooks indicate the maximum



These "Yellow-foot" babies are about 8 weeks old and have attained considerable size. At birth they are only a fifth of an inch long; they leave the "pouch" area after some 35 days.

number of teats in the pouch as ten, I have counted the total in various individuals caught as 8, 10, 11 and even 12! Thus the number of young carried at a time is distinctly variable and it seems that there are more "joeys" born than there are teats to accommodate them – with a resulting survival of those first at the "post." Indistinguishable in its off season resting condition from the rest of the ventral surface, the pouch cannot truthfully be referred to as such, for it is not an enclosed pocket as in the narrow-footed Pouched Mice (*Sminthopsis*) and is therefore merely a pouch area. In the northern Victoria range of this species, this skin area usually begins its seasonal development in early August with shallow skin folds appearing longitudinally on each side and longish white hairs growing from the anterior edge and to a lesser extent on each side so that they give a certain amount of protection later on to the otherwise completely exposed young. Within the pouch area itself there appears a growth of reddish or rusty hairs. The mammae become evident as red pointed dots. From experiences in breeding these marsupials in captivity and from observations while catching them in box traps in the Broadford, Tallarock area, Victoria, it appears that the time of birth is usually quite regularly mid-August, and that the females get away by themselves.

Newly born "joeys" are about a fifth of an inch in total length, pink in color and scarcely visible in the long white hairs that project from the fore part of the pouch. The tiny, naked offspring grow fairly rapidly but are inseparably attached to the teats from which they depend for some 35 days. As the climax of this period approaches the unfortunate mother is fearfully hampered in her activities, for the young are like so many cocktail sausages clustered about her abdomen, and it is understandable that, being so handicapped, her condition becomes poor and she is an easy mark for natural enemies. However, at the end of the 35-day period the young are capable of relinquishing their hitherto unbroken grip of the individual mammae and then they drink at will. Nevertheless for most of the daytime in the two ensuing weeks they still grip tightly and present an amazing spectacle as they squirm en masse. Towards evening the mother gently shakes or vibrates her abdomen to persuade the youngsters to lie loose in the nest. Then free as the wind (comparatively), she may skip about the bush, the rocks, curled bark and fallen logs seeking food.

It is almost impossible to photograph the Yel-

low-footed Bush Mouse on account of its swift movements. The best opportunity comes when the mother is loaded with large "stick-fast" young. In fact, should one of the bunch become detached and cry "Siss – siss – siss," she endeavors to stay put long enough for the temporarily unseated youngster to again climb on the overloaded band-wagon.

At the first sign of partial independence the babies, whose eyes are still closed, are most fully developed at the head end, both as to size and the faint covering of thin fur. Their eyes open within a few days of nest-resting; fur quickly becomes thicker, spreading posteriorly over the whole body, and if lifted from the nest during daylight each infant utters the repeated sibilant cry of "Siss – siss – siss!" until seizure of the mother's fur or teats in strong little jaws and forefeet lulls further anxiety in the comforting sense of security.

At three and a half months the now active, sharp featured and streamlined little fellows make excursions of their own, having become practically independent of the faithful mother. They have never seen their father and it is sad to report that if he encountered his children in their tenderer stages alone and unprotected, he would become a cannibal in the worst sense of the word.

To see a Bush Mouse family complete with mother – a mass of black-eyed, sharp-nosed, alert faces peering at one from the gum leaf nest – is a unique and fascinating sight. Such families are very noisy, indulging in mock quarrels with much sibilant hissing. Young Bush Mice of this species are even more foolhardy and venturesome than the adults, and about the month of December many come to untimely ends by ill-judged leaps into half-empty honey tins in bush apiaries, diurnal scampering in full view of watchful Kookaburras, or by presenting themselves to the pitiless attentions of cats, both wild and domestic.



A close-up photograph of the pouch area of a Yellow-footed Marsupial Mouse shows how apt is Mr. Fleay's description of the babies as "cocktail sausages." These youngsters were 18 days old, still pink and hairless, and are reproduced here at about two times their actual size.



Three inches off the floor of its tank, comfortably nestled in a growth of Amazonian Sword-plant, one of the 18-inch Knife Fish takes a nap. Other fishes in the tank do not disturb it.

Old Fish Do Learn New Tricks

By CHRISTOPHER W. COATES

EVERY ANIMAL COLLECTOR and animal keeper recognizes and uses as a matter of course the amazing ability of wild-caught creatures to adjust themselves in an astonishing degree to the ways of captivity. Even the casual visitor to a zoo, for instance, cannot fail to notice that newly-captured elephants soon learn to reach for peanuts offered them by their visitors.

Almost all animals in captivity must make dietary adjustments. Less obvious to the visitor, but of equal importance to the keepers, is the final settling down of the animal to acceptance of the limits of its enclosure. The Zoological Park's Mammal Department is always concerned when it turns zebras out into wire-enclosed ranges, for they may run right into the fence. In the Aquarium we must make sure that sharks, for example, recognize that they can't go sailing through a concrete wall and in their attempts to do so shatter their skulls. It is not difficult, once the keeper of such animals knows what they might do, to arrange that they don't do dangerous acts the first time they have the chance; thereafter the animals of their own accord learn not to do them.

Such matters are reasonably obvious to everyone who has anything to do with wild animals and they indicate that the animals all have some definite ability to learn things entirely foreign to their old ways of life, in very short order.

About two months ago we received two specimens of *Gymnorhamphichthys hypostomus* Ellis, one of the gymnotid eels popularly known as Knife Fishes, from the British Guiana-Brazil border. These extremely compressed fish resemble a slender knife blade about eighteen inches long. They have a rather long snout with a very small mouth and are without teeth, thus being unable to protect themselves against enemies by fighting.

They have a few scales but no armor of any sort. Neither are they fast or agile in the water. All of which is to say that they do not seem particularly well adapted to survival in a rough world. They are quite rare in collections; in fact we doubt if more than one hundred have ever been caught by any collectors other than natives who might poison a stream for food fishes. It might be thought that they are quite rare in their own waters, if it were not that an intensive search does turn up a number at a time. Our specimens are quite large and thus are probably old.

A clue to their apparent rarity is offered in their initial behavior in the Aquarium's tanks. When they were first brought in they immediately burrowed into the sand at the bottom of the water and remained there, going in so carefully that not even a low pile of sand marked their location. They did not even disturb the roots of plants in the heavily-planted tank and with these two fish, as with some others we received in 1934,[1] the tank always looked empty during the daytime, so that our tankmen often thought the fish had somehow managed to escape.

This burrowing into the sand during the day-

(*Continued on Page* 30)

Plants Don't "Balance" An Aquarium—But the Myth Dies Hard

About twenty years ago Dr. Charles M. Breder, Jr., at that time Research Associate at the old New York Aquarium at the Battery, got interested in the chemistry of standing aquaria; he wondered what was happening to the water — and the fish — in small tanks of the kind that are often found in homes.

One of the things that everybody "knows" about home aquaria is that aquatic plants "balance" them and maintain an equilibrium of oxygen for the fishes.

Dr. Breder found that that wasn't so at all. Plants do *not* oxygenate the water in fish tanks; the oxygen so necessary to the fish is absorbed by the water from the atmosphere. The "limiting factor" in such tanks is an excess of carbon dioxide, rather than a lack of oxygen. As far as respiration is concerned, fish do just as well in tanks without plants as with them!

This was a rather revolutionary finding, but Dr. Breder published it casually in 1931 as a small note in *Copeia,* the journal of the American Association of Ichthyologists and Herpetologists. He was more interested in theoretical concepts than in the practical application of his work to the keeping of fishes in the home.

Other members of the Aquarium staff, in more direct contact with fish hobbyists, made use of Dr. Breder's research, however, and off and on for the past twenty years Curator-Aquarist Coates of the Aquarium has written about the plant-fish relationship and talked about it to aquarists who asked his advice about setting up small tanks at home.

Recently Assistant Curator Atz has taken up the fight to correct the popular, but wrong, impression. A year ago he published an article, "The Myth of the Balanced Aquarium," in *Natural History*. It was so closely reasoned and so buttressed with documentation that it was reprinted this winter in extended form by *The Aquarist and Pondkeeper,* a British journal. Subsequently *Veterinary Excerpts,* a trade journal for veterinarians, digested the article — although warning its veterinarian readers that their clients might not believe the true facts, because of the ingrained nature of the popular belief.

Mr. Atz is carrying on his campaign to set aquarium-keepers straight about the actual functions of plants in home aquaria by a further article in a forthcoming issue of *The Aquarium Journal* and an article on "What Not to Teach About a 'Balanced' Aquarium" in *The American Biology Teacher.*

But myths die hard and a good proportion of the correspondence the Aquarium has had in recent weeks from fish-keepers is decidedly disbelieving. On the other hand, one newspaper columnist accepted Mr. Atz's statements so wholeheartedly that he warned his readers against keeping plants in their aquaria, saying they were dangerous to the fish!

News from the Conservation Foundation

Yale Is Breaking New Ground

On January 16 the Yale University News Bureau released the following statement – obviously of extreme interest to every member of the New York Zoological Society:

New Haven, Conn., January 16 – Yale University in cooperation with The Conservation Foundation is establishing the country's first graduate program of research and instruction in conservation of natural resources.

The courses will begin September, 1950, and one of the leading educators and authorities in the field, Paul B. Sears, will be in charge of the Yale program with the rank of Professor of Conservation, a newly-created post.

Professor Sears is now at Oberlin College, but will leave to join the Yale faculty next summer.

The course in conservation will be for graduate students only, although it is hoped that a similar program for undergraduates will be established in the future. The graduate course will require two years of study and research, and will lead to the degree of Master of Science in Conservation, the first time such a degree is to be awarded in this country.

The program will be administered by the Division of Sciences and the Graduate School. "The time has come when the whole field of conservation is so important that the training of competent personnel is a problem for our universities," Edmund W. Sinnott, Director of the Division of Sciences, said in announcing the new Yale program.

The Conservation Foundation, which was founded in 1948 with headquarters in New York, "to promote conservation of the earth's life-supporting resources," has given its support and cooperation to the Yale program. Fairfield Osborn, President of the Foundation, stated that "This should prove a step of extraordinary importance in the development of the Conservation movement in our country. The Foundation is glad to enter with Yale into this program that will provide greatly needed Conservation man-power trained at the highest educational level.

"We believe," he said, "that the course taken by Yale will be followed by other universities and colleges throughout the nation."

The inauguration of the Yale program indicates the growing interest of educators in problems of conservation, according to Professor Sinnott.

"Experts are agreed that unless steps are taken to check soil erosion, to cut down the waste of forest reserves, and to conserve other resources, there will be tragic implications for human life," he said. "Serious problems of sociology and economics are involved as well as the whole question of man's stewardship of the earth's resources."

The bulk of present-day conservation work is carried out by the government, he pointed out, but emphasized that there is a need for independent groups to evaluate and initiate conservation procedures and to serve as advisors to government agencies.

Training men at Yale for the professional field of conservation will help supply personnel for such independent groups, he said. Professor Sinnott also explained that there is a growing demand from industry and government, both here and abroad, for men who have been trained in conservation.

Professor Paul B. Sears, in directing the Yale program, will himself teach two graduate courses – General Ecology and the Ecological Basis of Human Society. In addition, the students will take many of the regular Yale courses already in the University curriculum bearing upon conservation. Some of these are Plant and Animal Ecology, Geology of Soils, Oceanography, Biogeo-chemistry, Forestry and Microbiology.

(*Continued on Page* 28)

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

Paper by Jocelyn Crane Gets Morrison Prize Mention

A technical paper by Miss Jocelyn Crane, research associate of the Department of Tropical Research, was given honorable mention in The A. Cressy Morrison Prize Competition in Natural Science of the New York Academy of Science in December. Her paper was entitled: "Comparative Biology of Salticid Spiders at Rancho Grande, Venezuela. Part IV. An Analysis of Display."

Twelve papers were submitted in the competition and the two awards of $200 each were made to Dr. Abraham Slavin for a paper on "Stability Studies of Structural Frames" and to Harold R. Hagan for "Embryology of the Viviparous Insects."

Miss Crane's paper has been published in *Zoologica,* Part 4, 1949.

Taking the Census

Although presumably accurate monthly counts of all specimens of live animals are made by the Mammal, Bird and Reptile Departments, the utmost pains to arrive at an exact count are taken at the end of the year. The December 31, 1949, census will probably show increases in species and specimens in all three departments. This year, as occasionally in the past, two mammals will be listed that no one has yet seen — Agile and Bennett's Wallabies that are still in their mothers' pouches. The Peafowl population is up; three broods, of a total of 12 birds, were reared this past year while at liberty in the Zoo.

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The In-Service Course for Teachers, on how to use the facilities of the Zoological Park to greatest advantage, concluded its series of 15 hour-and-a-half sessions in the Zoo on January 10. Forty-five teachers completed the course, and because of the heavy registration demand last fall it will be repeated in the spring.

Conservation Notes

(Continued from Page 27)

Actually, a considerable part of the Yale program will be centered upon study and research in the field. The Connecticut River Valley, which has been described as an outstanding example of both good and bad conservation practices, will serve as the outdoor "classroom" for the students.

Water Crisis Long Foreseen

BY GREAT GOOD FORTUNE, one of The Conservation Foundation's most active research projects is developing information on a problem which has attracted a high degree of interest in recent months.

For a period of approximately two years the Foundation's staff investigated water resources problems in order to determine what information was lacking to achieve a full understanding of how conservation practices might be applied to assure continued supplies of water where they are needed. As a result, last July with the financial backing of The Rockefeller Foundation, we initiated a year's study of ground water shortage problem areas in order to classify and describe these and to find out how changes in this vital resource might be avoided and corrected.

Although the current New York City shortage is not a ground water shortage, it does point up vividly the urgency of water problems in this region and in others. Too often the apparent constant availability of water at an inordinately low price lulls people into unawareness which in turn



Our new Okapi, brought from the Belgian Congo by Charles Cordier last June, has settled down to a placid and healthy existence in the Antelope House. The animal was captured during the winter of 1948-9 in the equatorial forest near the village of Bilota, in the eastern Congo.

results in lack of careful planning. To date we have found a number of individual communities which are hard pressed for ground water for domestic, industrial and agricultural use. A classification of these by rate of use will enable us to project possible future growth and future control in order to provide sustained yield from these sources. For the first time a complete picture of ground water problems will be available from the point of view of actual use rather than from geological origin. Further analysis is necessary in the coming six months in order to indicate the specific nature of the results. However, by the simplest possible calculations we see that although there are water shortages which occur in only about one per cent. of the country's land area, the population affected by this is something over twenty-five per cent. of the nation's people. Therefore, these shortages not only mean something to the individuals immediately concerned, but also mean even more to business and industry outside of these areas who either serve or depend on these shortage communities.

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New Light for the Aquarium's Tanks

One of the difficult problems of exhibiting fishes and other underwater creatures is that of providing the proper light for them. Curator-

Aquarist Coates has experimented with various lighting systems for many years, improving the illumination of the tanks of the Aquarium. Recently a new type of fluorescent tube has become available that has proved the best of all artificial lights for aquaria.

Although fluorescent lights have always presented the advantages of a large, uniform source of light, small production of heat and low consumption of electricity, the older types were quite unsatisfactory for aquaria. They gave an extremely "cold" light – as if the tank were illuminated by moonlight – and destroyed the vivid reds and warm oranges and yellows that play so important a part in the coloration of fishes. The new fluorescents, aptly called Warm Tint and Warm White, do not produce this unnatural effect. Moreover, aquatic plants seem to thrive under them. Better growth of aquatics than ever before has been obtained by using these new tubes in the Aquarium's 300-gallon tanks that contain 30 or more inches of water.

Full provision has now been made to employ fluorescent lights, as well as other kinds, in the new New York Aquarium that we are planning to build at Coney Island. – J.W.A.

Old Fish—New Tricks

(*Continued from Page 26*)

time seems to be very deeply ingrained in the fish and is probably one of the reasons why it survives as a species, inasmuch as it seems to have no other means of defense.

Our present specimens were put into a tank four feet long, well suited to their shape and general swimming activity, and they were fed with masses of Tubifex worms which they ate during the night. At least, the worms disappeared, although the fish were not seen for at least one

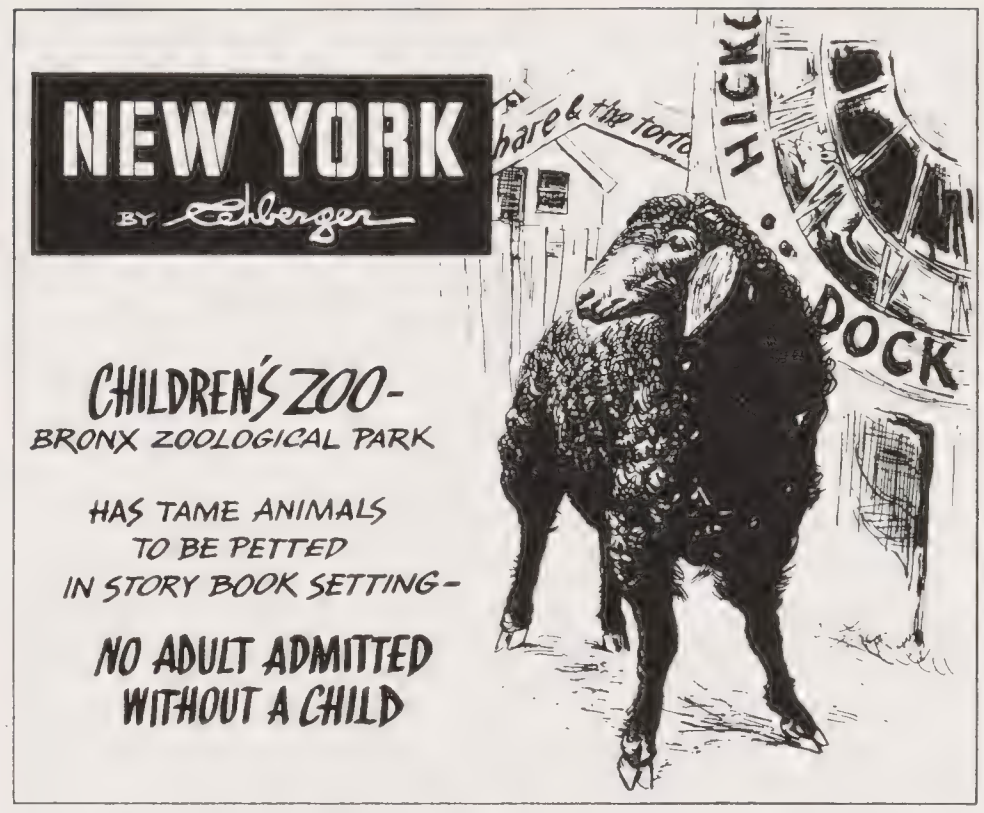


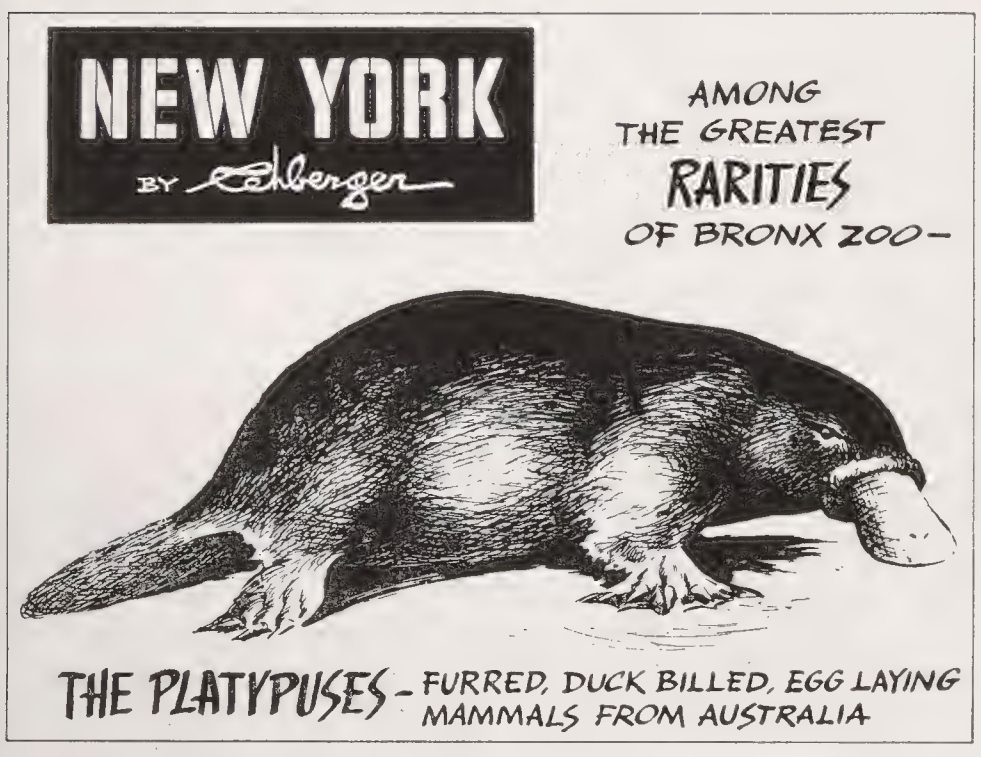
Both fishes and aquatic plants flourish under a new type of fluorescent lighting that has been applied to the Aquarium's tanks. Here a contented community of Scalares, Blue Gouramis, One-spot Characins and a freshwater Puffer lives among a luxurious growth of 5 kinds of aquatics.

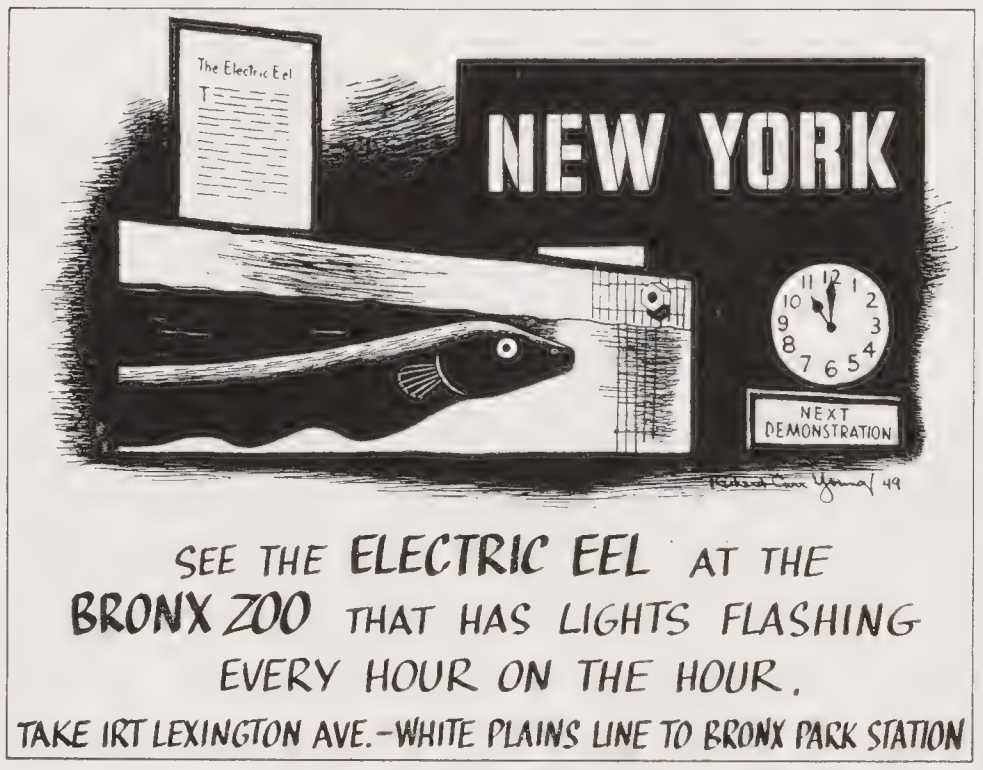
The Zoo Goes Underground — In the Subway

Car cards prepared by the New York Subways Advertising Co. about special attractions at the Zoological Park have been displayed in the rapid transit systems of the city during the past year and three examples are shown here.

Although the Zoological Park has no way of knowing what proportion of its visitors are influenced by such means to come to the Zoo, the cards are undoubtedly a stimulus. The Boston Road, or subway, gate has always accounted for the major part of our attendance.







month. Then they seemed to have become careless about their sleeping quarters, for they were observed simply lying on the surface of the sand.

At first we thought they might be sick or unhappy, but aside from simply lying at the surface of the sand they seemed to be quite all right. After another week or two they did not even take the trouble to sink to the bottom of the tank when they felt like sleeping; they simply turned on their sides and slept on any surface that would support them. At the present time they usually sleep on a mass of leaves of underwater plants, so that they are suspended in midwater.

This action would seem to be a complete negation of all their previous behavior and "instinctive" desire to be hidden during the daylight hours; it seems to be an important adjustment to the security of captivity, in which they have learned that they need not go to the labor of covering themselves.

[1] Some Notes on the Curious Behavior of Two Gymnotid Eels from South America. *Bulletin New York Zoological Society,* Vol. XXXVII, No. 2, 1934, pp. 59-61.

Our first Pere David's Deer fawn, born last April 10, is now showing the tiny buds of his first antlers.

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The Zoo's first birth in 1950 was a Nyala, born on January 4 in the African Plains Antelope House.

PUBLICATIONS OF INTEREST

HIGH JUNGLE, by William Beebe. xii, 1-379, 49 photographs, 1 map. Duell, Sloan and Pierce, New York, 1949. $4.50.

William Beebe's evident delight in returning to his first love — the jungle — after twenty years of diligent and productive work with the fishes and other animals of West Indian and Pacific islands and coral reefs, and with the weird and unseemly creatures of the deep-sea that he pursued with net and bathysphere, is manifested in every page of this fascinating volume. In the preface, Dr. Beebe states his credo: "To us, as naturalists, jungle is an epitome of beauty, comfort and intense interest." To those who have been fortunate enough to share the jungle with him, there will be no quibble as to this statement on any score; some of the acquainted and unacquainted might question the "comfort" of the jungle.

In his early British Guiana volumes, "Jungle Peace" and "Edge of the Jungle," Dr. Beebe devoted much attention to the smaller inhabitants of the great forests of South America. In "High Jungle," to our great enjoyment, the little creatures are back again in full force — the remarkable frogs Gawain and Guinevere of Guiana are supplanted by the Great Gray Frog whose obstetrical aptitudes include a long slit down its back from which emerged perfect little froglets! Amazing migrations of moths and butterflies and battles of giant beetles recall the wonderful Guiana stories of the behavior of army ants and the leaf-cutting or parasol ants.

Rancho Grande, the abandoned unfinished citadel high in the jungle-covered mountains of northern Venezuela, 60-odd miles west of the capital, Caracas, was the extremely adequate base from which Dr. Beebe and his staff attacked some of the innumerable biological problems that the jungle insistently laid at their doorstep. In "High Jungle" a few of the marvelous creatures that came before their microscopes, binoculars and telescopes are described and their habits placed before us in excellent photographs and splendid prose — the minute moth that built around its eggs a palisade made of its own body-scales; the fer-de-lances that dwelt in the deserted cul-de-sacs of Rancho Grande; the staff monkey used as a "taster" of insects to determine their edibility or inedibility and the relationship of their color or pattern to such inedibility; hummingbirds and their incredible aerial gyrations; the butterflies, moths and birds that unexplainedly migrated through the nearby pass of Portachuelo, to name but a few. To those who are interested in the more intense perceptions of sound and sight and taste and smell, William Beebe brings rich stimulation from the Venezuelan jungle. — JOHN TEE-VAN.

HAWKS ALOFT — THE STORY OF HAWK MOUNTAIN, by Maurice Broun. Dodd, Mead Co., New York, 1949. $4.00.

The story of Hawk Mountain is an epic of practical conservation that has few parallels. Since its success has stemmed largely from the determined application of Maurice Broun, Director of the Sanctuary, it is fitting that the first complete history of the undertaking should come from his pen.

It was a piece by Richard Pough, printed in *Bird Lore,* 1932, that first drew the attention of naturalists to the autumnal slaughter of migrating hawks, by "sportsmen" on a ridge called Blue Mountain, near Drehersville, Pa. Maurice Broun read that piece and so did Mrs. Rosalie Edge, redoubtable defender of wild life through her Emergency Conservation Committee. Two years later, their indignation found opportunity for practical expression. In October, 1933, Dick Pough learned that "Blue Mountain" could be purchased at a low figure. In August of the following year, Mrs. Edge obtained a lease of the property, with an option to purchase. Immediately, Maurice Broun was asked to act as "warden." He accepted and the ensuing fifteen years have justified the choice.

Hawk Mountain and the surrounding 1398 acres are now a sanctuary for all wild life, protected from gunners forever. Here the thrill of watching the autumnal passing of thousands of hawks answering the mysterious urge that activates migration is experienced by hundreds of fascinated onlookers. No one who has sat upon the craggy summit and watched that swift and silent passing can remain unmoved.

Mr. Broun's book is a monument to conservation at work. Also, it will act as a stimulant to further effort in related fields. — LEE S. CRANDALL.

AN ILLUSTRATED KEY TO THE LIZARDS, SNAKES AND TURTLES OF THE WEST. By Jay M. Savage. 32 pp., 176 figures, 7 map plates, references. Vol. 2, Naturegraph Pocket Keys. Naturegraph Company, Los Altos, California, 1949. 50¢.

A simple, well-illustrated tabloid key to reptiles found west of the Rockies. Designed primarily for amateurs. Unfortunately it employs the binomial rather than the more modern trinomial system of classification, contains several technical errors and lacks an index. Nevertheless, its brevity, range maps and apt sketches commend it for general field use. — BRAYTON EDDY.

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EVERY SO OFTEN we have a request from libraries here or abroad for complete files, or certain issues, of our two periodical publications, "Animal Kingdom" and "Zoologica." We can supply most of our back-issues, going back to 1901 in the case of "Animal Kingdom" (or "Bulletin," as it was then called) and to 1907 when "Zoologica" was established. But we lack some numbers of both publications — numbers that are completely out-of-print and out-of-stock. We also need two issues of a long since discontinued journal, "Zoopathologica."

Library request are usually from important institutions and we would like very much to fill their orders. Nothing irks a librarian more than a broken set of periodicals; we sympathize — but we can do nothing more unless our Members come to our, and the librarians', aid by sending us back numbers they no longer care to preserve.

Here is the list of out-of-print issues. Copies will be gratefully received.

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1942 — January-February
1944 — July-August
1945 — November-December
1947 — May-June

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Volume I, No. 8
Volume IV, No. 5
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ZOOPATHOLOGICA

Volume I, Nos. 1 and 2

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QUESTIONS

"April, April, laugh thy golden laughter"—SIR WILLIAM WATSON

SEVERAL YEARS AGO, it will be recalled, an innovation was established in the Zoological Park: namely, the "Question House." It was done in order to provide a place where visitors could readily and at firsthand obtain answers to questions about animals – any kind of question about any kind of animal. The little building is staffed by young men and women who are well along the way to becoming qualified zoologists. At hand are reference books to fill in gaps in knowledge. If the question happens to be a "poser," the visitor later receives a carefully-prepared response by letter.

The Question House has been a lively success and has undoubtedly helped somewhat to improve people's knowledge concerning animal life. Several other zoological gardens have adopted the idea and have established "Question Houses" of their own – a most satisfactory and unexpected development.

The great majority of the questions asked are serious and sensible; some are intended to be serious but are far from sensible. In running through the latter we find the following gems:

"Is it true that when a man-eating Tiger eats a man, it adds another stripe to its coat?"

"Are more animals in the world right-handed than left-handed, and if so, why?"

"How long can a man live? What about ladies?"

"Why does the spider marry the Black Widow when he knows she is going to kill him?"

"If a pollywog turns into a frog, does a frog turn into anything?"

"Is it true that the Giraffe really has a voice but it gets lost on the way up the long neck?"

"How do Skunks stand each other?"

Who could ask for better antidotes to gloom in these parlous times of political and social tensions? There is still plenty of gaiety in life, even if one needs to go to the Zoo to find it.

We realize, though, that our job of educating the public in zoology is not quite completed!

Fairfield Osborn

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APR 17 1950



This is one of the largest Electric Eels at present in the Society's collection. It is 6 ft. 5 in. long and weighs approximately 45 lbs. Curator-Aquarist Coates's left hand supports the lower end of the head and body; the long remainder is tail.

The Electric Eel Is a Useful Tool

By CHRISTOPHER W. COATES
& DAVID NACHMANSOHN

The New York Zoological Society is the receiving point for hundreds of Electric Eels annually because they are important in medical and neurophysiological research on the mechanism of nerve activity.

At the end of the 18th century the Italian physiologist, Luigi Galvani, made some startling observations on the nerve and muscle taken from the leg of a frog which led him to the conclusion that nerve activity is associated with electricity. The news of these experiments was received with great enthusiasm, not only among physiologists, but among all scientists and intellectuals. For the first time there appeared some hope, however remote, for the eventual understanding of the function of the nervous system of which the brain forms a part. Since the brain not only dominates our body but is also the site of man's intellectual abilities, creative forces and emotions, the great excitement created by Galvani's observations is easily understandable.

Actually, the experiments of Galvani turned out to be inconclusive and were severely criticized by the Italian physicist, Alessandro Volta. Half a century later, in 1843, DuBois-Reymond demonstrated conclusively that nerve activity is associated with electric currents. Since then, a whole century of neurophysiology has been almost entirely devoted to the study of electrical signs of nervous action, and much valuable information has been obtained in this way as to the nature and function of the nervous system.

The mechanism of conduction in a nerve fiber is, however, fundamentally different from that of electricity in a wire. In copper, or in any other metal, electric current consists of a flow of electrons. Such a flow of electrons is excluded in a living cell, which is a fluid system and an electrolytic conductor. In the 19th century physiologists were already aware that the electrical manifestations of nerves are only signs indicating that something is happening. More recently Gasser compared the electricity – that is, the action potentials observed during nervous activity – to the ticks of a clock. While indicating that the clock is working, the ticks do not reveal the mechanism, do not tell *how* it operates. Several facts indicate that the small electric currents which propagate the nerve impulse along a nerve fiber cannot derive the energy from the stimulus itself, as for instance, in the case of a sound wave. The energy must be supplied within the nerve fiber itself and must result from chemical reactions at each point where a small local current is generated.

Without knowledge of these chemical reactions the mechanism of nervous function cannot be understood. Two features of conduction of nervous impulses make the chemical analysis of this phenomenon extremely difficult, however: (1) the extraordinarily high speed, and (2) the smallness of the chemical reactions involved.

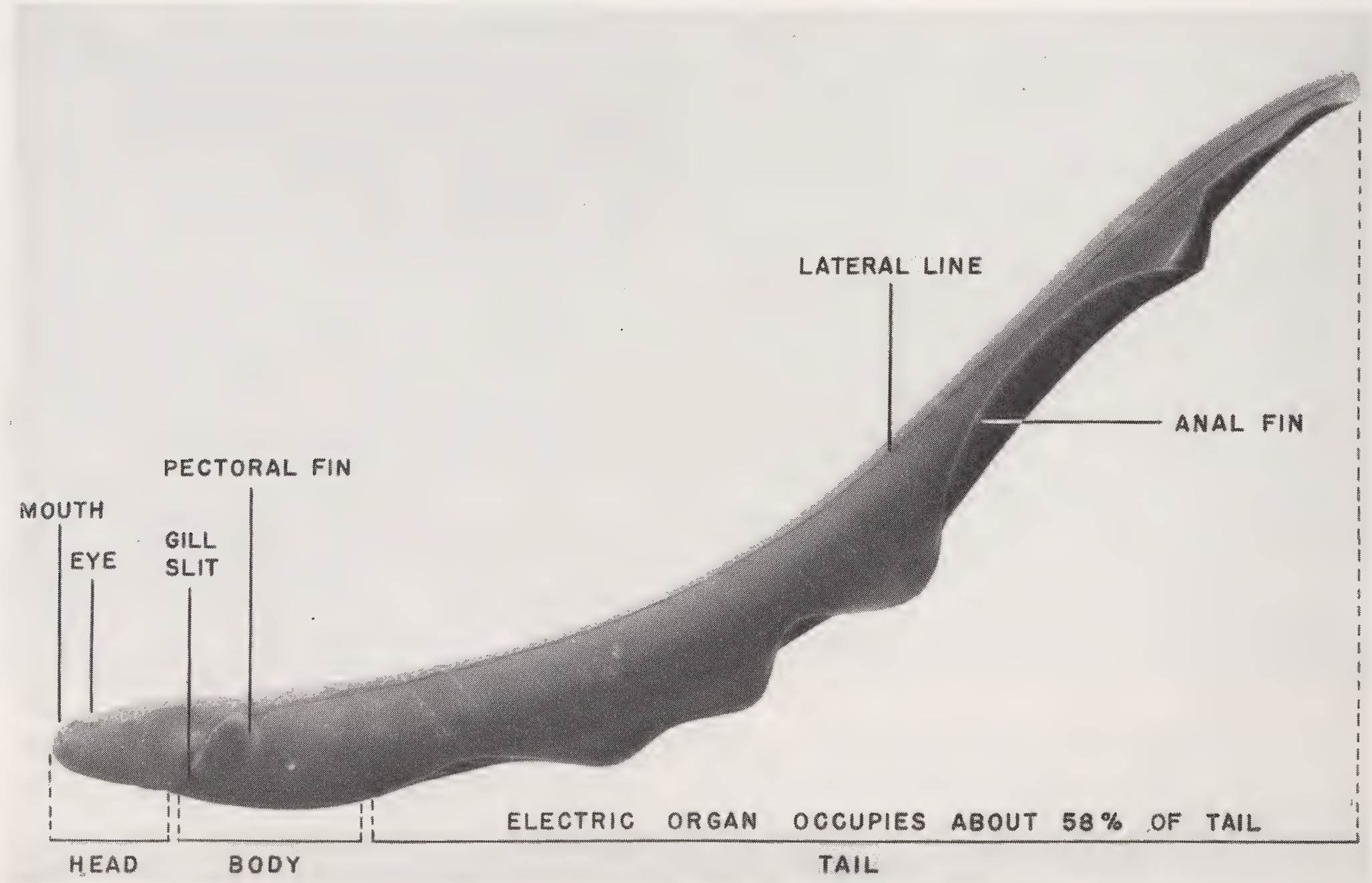
The late Danish physiologist, August Krogh,

once stated that it would seem nature has created quite a number of animals to help solve special physiological problems. For the correlation of chemical and electrical events, nature has indeed provided a material which is a most powerful and invaluable tool for attacking this problem: the electric organs of electric fishes.

The powerful shock caused by certain fishes has been known since ancient times, but it was not until 1772 that Welsh demonstrated before the Royal Society in London that these shocks are actually electric discharges. This demonstration of electricity produced by a living creature occurred 20 years before Galvani published his famous observations on frog nerves and muscles. At first, physicists like Sir Humphrey Davy, Michael Faraday and Henry Cavendish became interested in this type of electricity and devoted quite a bit of time to the study of it. Following Galvani's discovery, physiologists also became interested in it. In the last year of his life Galvani himself started to work on the electric organ of the Torpedo, and in the second part of the 19th century a number of investigations were carried out on the anatomical and histological structure of electric tissue and its electric characteristics, the latter especially by DuBois-Reymond.

Several species of fishes are known to possess electric organs. The three species with strong electric powers are the Electric Eel from South American rivers with a maximum discharge averaging from 500 to 600 volts; the Torpedos, marine fishes of several species, in which the voltage may vary from 50 to 150 volts according to size; and finally the Electric Catfish from the freshwaters of tropical Africa with a voltage of about 40-80 or more.

The most important and most interesting aspect of the powerful electric discharge of fishes' electric organs is that they are fundamentally identical with the electricity of ordinary nerves. All characteristic features of nerve electricity are found in the discharge of these organs. The only difference is the peculiar arrangement of the cellular units, the electric plates, which are placed in series as in a voltaic pile. In the organ of the Electric Eel, for instance, there are 5,000 to 6,000 elements, arranged in series, from the head to the caudal end of the organ. Each element has a voltage of about 0.1 volt, which is the same as



While this photograph shows quite a small Electric Eel — it is only about 7 inches long — the proportion of head and body to tail is the same as in the very much larger eels ten times longer.

that found in ordinary nerves. When added together, as they are in series, they make up the total of 500 to 600 volts. It is interesting to note that Volta discovered the analogy between his pile and the electric tissue and called his pile an artificial electric organ. There is, however, a fundamental difference that was noticed by Berzelius. In 1817 this great Swedish physicist described the electric organs in his textbook on chemistry under the title: "Electricity generated by an organic chemical process." His conclusions were based on the fact that in the voltaic pile the discharge is automatic, whereas in the electric organ it is a voluntary act under the control of the fish. Consequently, it could not be a physical process as in the voltaic pile.

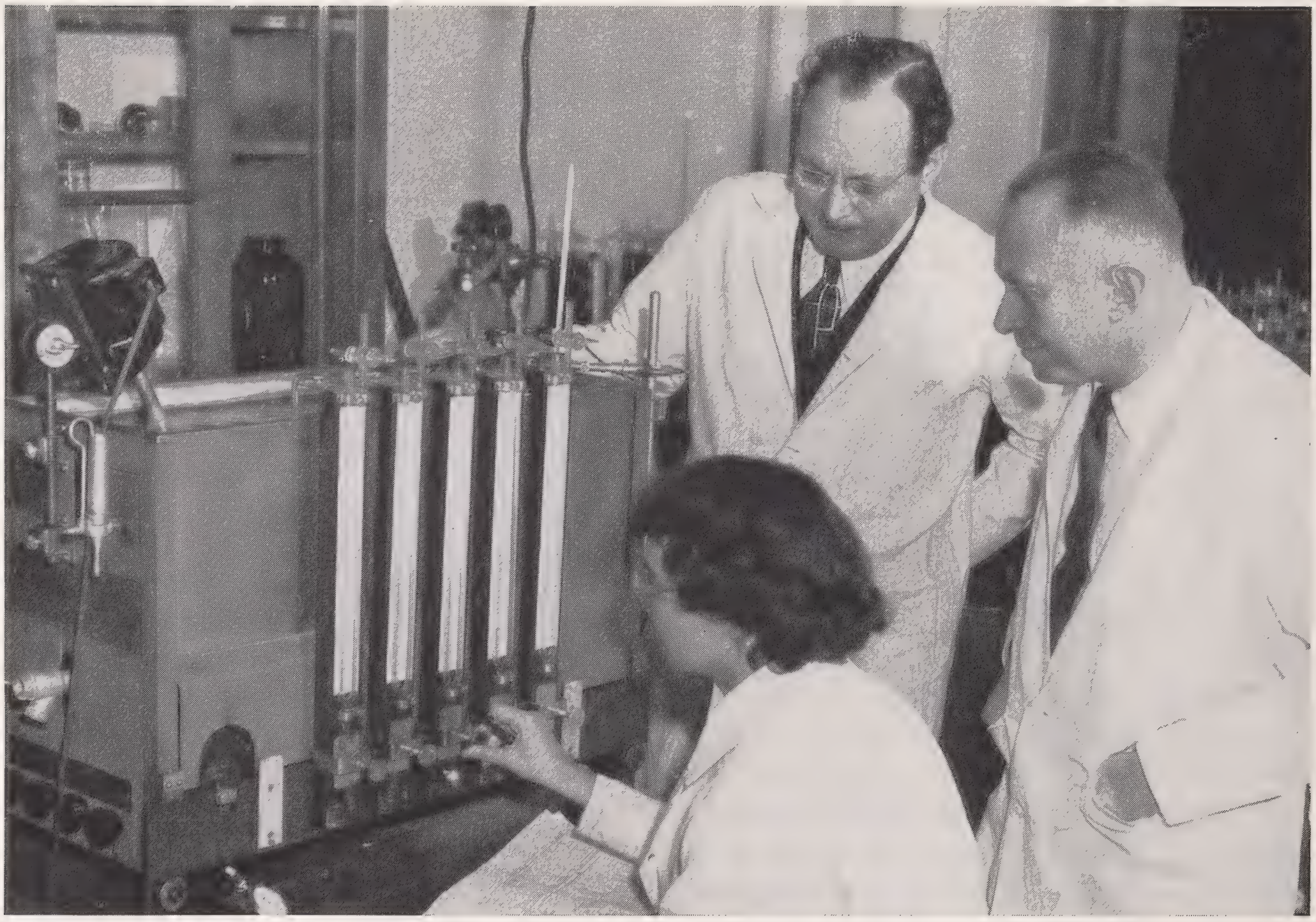
The electricity of electric tissue is fundamentally identical with that of ordinary nerves. This identity makes the material so highly important for all those interested in explaining the nature of nervous function, for in these organs both chemical and electrical processes are so amplified that they are within the range of measurement of available methods. Studies of the enzymes in these electric organs and the correlation between electrical and chemical events have given us considerable information as to the mechanism by which nerve electricity is produced. A few results obtained with electric fishes may be briefly described to illustrate the usefulness of the material and the progress which has been achieved in these observations.

During the last forty years a chemical compound, called acetylcholine, has been associated with nerve function. The precise role of this compound was, however, a matter of great controversy. A hypothesis proposed by some physiologists, called the theory of neurohumoral or chemical transmission, stated that acetylcholine was secreted from the nerve endings and acted as a transmitter of impulses to the second unit, that is, another nerve or a muscle. There were, however, so many contradictions and difficulties that most neurophysiologists never accepted this hypothesis. Studies of the enzymes associated with the metabolism of acetylcholine have shown that the original hypothesis as to the function of this compound has to be modified. The release and removal of acetylcholine are events which are intimately associated with the electrical manifestations of nerve activity. They occur apparently in the nerve membrane surrounding the nerve axons and are necessary links in the chain of reactions which generate the currents, propagating the impulse. Among the great variety of facts accumulated in favor of this view, the findings with the electric tissue have been in several respects extremely important and useful.

The enzyme which inactivates the acetylcholine by splitting it into its two components – acetate and choline – is called acetylcholine esterase. It was found that this enzyme occurs in extraordinarily high concentrations in electric tissue. In the strong electric organs of the Torpedo and Electric Eel 100 grams of tissue may split 100-300 grams of acetylcholine per hour. This is an extraordinarily high activity for an enzyme and is particularly remarkable in view of the fact that the organs contain 92 per cent. of water and 2 per cent. of protein, as compared with 70-75 per cent. of water and 20 per cent. of protein in most other tissues.

The unusually high concentration of a specific enzyme in a highly specialized organ suggests that the enzyme activity might be associated with the prime function, i.e., the generation of electricity. In that case one might expect to find some relationship between the strength of the discharge – its voltage – and the activity of the enzyme. It was indeed found that in weak electric organs the enzyme concentration is low, in strong electric organs, high.

A more quantitative analysis became possible in experiments on Electric Eels. In the electric organ of this fish the frequency of the electric plates per centimeter decreases from the head to the caudal end. Since each plate has about the same voltage (0.1 volt), the voltage per cm. decreases from the head to the caudal end correspondingly. When the concentration of acetylcholine esterase was tested, a most striking parallelism was found to exist between the voltage per cm. and the concentration of the enzyme. Both decreased in the same proportion. The voltage per cm. varies not only from head to caudal end in the same specimen but depends also on the size of the specimen. It may reach very high values in small-sized fish and is small in large specimens.[1] This made it possible to



Curator-Aquarist Coates and Dr. David Nachmansohn watch the workings of a Warburg apparatus for measuring an eel's enzymatic activity, at the College of Physicians and Surgeons.

establish the parallelism between voltage and acetylcholine esterase over a wide range.

The high concentration of acetylcholine in electric tissues made another series of studies possible. Electric tissue is extremely suitable material for obtaining pure enzyme; in fact, it is possible to separate it from all other protein substances. After the purification of acetylcholine esterase from electric tissue was achieved to a degree where only one protein was present, the reaction rate could be estimated. It was found to be surprisingly high. The time required by one enzyme molecule to inactivate one acetylcholine molecule is 3 or 4 millionths of a second. This terrific speed, which is about the highest known among chemical reactions of a living cell, appears quite significant. It had to be postulated that any chemical reaction associated with electrical manifestations would have a speed comparable to the latter. The speed of this particular enzymatic reaction is actually sufficiently high for the assumption that it precedes the electrical manifestations of nervous activity. The finding is particularly pertinent in connection with many other findings that point to the role of the enzyme in conduction.

During the war, a powerful poison gas, diisopropyl-fluorophosphate or DFP, that was considered a most dangerous potential chemical warfare agent, was developed. The reaction of DFP with acetylcholine esterase in the body accounts for its toxic symptoms. Since Electric Eels are by far the best source of this enzyme, a large number of them were flown from the Amazon to New York by special plane to provide material for the study of the mechanism of DFP poisoning.[2] These studies became, however, not only valuable for the toxicology but also of great theoretical interest for the understanding of nervous function. It could be demonstrated in many ways by using this substance in the laboratory that it is impossible to dissociate acetylcholine esterase activity from conduction under any condition.



This unprepossessing-looking creature is an Electric Eel coming to the surface of the water to take a gulp of air. Since it breathes atmospheric air, the Electric Eel must have access to the surface two or three times a minute; eels have been drowned when they were accidentally kept submerged for only ten minutes. They can, however, withstand periods of 72 hours out of water, so long as their mouths are kept moist. The cataract-clouded eyes are the rear pair of white spots. The nostrils are the white spots in front of the eyes, nearer the open mouth.

A third line of investigations in which the analysis of electric tissue was decisive was the study of the chemical reactions providing the energy necessary for conduction.[3] In these observations on the electric organs of the Electric Eel a whole cycle of chemical reactions was associated with the electrical events of the nerve impulse and led to the discovery of a new enzyme which forms acetylcholine, the knowledge of which is of primary importance for the understanding of nervous function.

It would be a distorted picture to claim that all the progress was made possible by the availability of electric tissue. Other nerve preparations were of great value, as for instance the giant axon of squid. The development of enzymology in general, the availability of radioactive and stable isotopes, and especially the use of modern physical techniques – all were important in promoting the advances achieved during the last ten years. There can be no question, however, that the results achieved with the aid of electric tissue were in many instances decisive for the progress we have made in arriving at present-day views concerning the mechanism of nerve activity. New pathways have been opened to the understanding not only of the physiology but also of the pathology of the nervous system. Many disorders of the nervous system which only recently appeared beyond the grasp of experimental approach now have become open to a rational study.

[1] Nachmansohn, D., C. W. Coates & M. A. Rothenberg. *Jour. Biol. Chem.,* 163 (1): 39-48, 1946.

[2] Bridges, W. *Animal Kingdom,* 49 (2): 73-75, 88, 1946.

[3] Nachmansohn, D., R. T. Cox, C. W. Coates & A. L. Machado. *Jour. Neurophysiol.,* 6: 383-396, 1943. Nachmansohn, D., C. W. Coates, M. A. Rothenberg & M. V. Brown. *Jour. Biol. Chem.,* 165 (1): 223-231, 1946.

Some Learn—and Some Don't

WHEN MAGAZINE WRITERS ask (as they often do): "Which animal is the most intelligent?" it is customary for the Zoological Park staff member being questioned to reply: "That's a hard question to answer, for each animal is sufficiently intelligent for its own purposes, in its own sphere – else it wouldn't still exist."

In its own sphere. But a Zoological Park can seldom reproduce all the conditions of the wild life for each of its inmates, and the animals, as a result, usually have to make a certain number of adjustments.

Some do, and some don't.

In mid-February we received from the San Diego Zoo a lovely female specimen of the Lesser Panda in exchange for one of our three wild-caught males. The San Diego animal was zoo-bred and had never known anything but the warmth and sunshine of southern California, to which it was perfectly adjusted although its species-experience is something quite different in the high, cold Himalayas and the rugged northeastern corner of India. California warmth it was accustomed to, and could accept – for Mrs. Belle Benchley has been breeding Lesser Pandas successfully for a good many years in the San Diego Zoo. Would this particular specimen be able to take the cold and snow and ice of mid-February in New York?

It could. Its new home with us is in the former Raccoon enclosure adjacent to the Otter Habitat, and although a shelter is provided in the base of the wall the California-bred panda showed no disposition to shiver and seek refuge inside on its first day with us. It is, after all, protected by a thick coat, and apparently it is hardy by nature and able to withstand considerable extremes of heat and cold.

Water is something else again. Lesser Pandas, as we have known since we first exhibited them many years ago, are not water-lovers, despite their relationship to Raccoons (which even dabble their food in water before eating it) and Giant Pandas which find great solace in a pool or a spray on a hot summer's day. Lesser Pandas are cat-like in their dislike of getting wet.

In the wild, of course, a Lesser Panda is per-



Lesser Pandas have a strong aversion to water. This one, unlike our new specimen from California, obviously knows what water is and is not in danger of falling into its out-of-doors pool.

fectly familiar with water in the form of streams and ponds. Thus, although there is a sizeable pond in our Lesser Panda Enclosure (for the convenience of its original Raccoon inhabitants), the wild-caught pandas scrupulously avoid it.

Not so our newcomer from California. In the San Diego Zoo the Lesser Pandas occupy a large out-of-doors area that is beautifully planted to give the animals a chance to climb, but which contains no streams or ponds. Our new panda had never in its life encountered anything resembling a sheet of water.

And so, on its first day in its new home, it casually walked across the enclosure, up to the bank



Peafowl come from hot climates, but they are hardy enough to withstand New York winters without apparent discomfort. This bird roosted in the open during a heavy fall of snow.

of the stream — and straight into the deep water.

It went in all over, suddenly and completely. And it is certainly not taking many anthropomorphic liberties to say that when it scrambled out it was a shocked, disgusted and disillusioned animal. Cat-like, it stalked about stretching one wet leg after another and giving it a shake. It was soaked to the skin and obviously beginning to feel the cold, so we prepared a warm bed of hay inside the wall-shelter and rigged up a small electric heater that would maintain a temperature of 40 to 50 degrees. The heater was kept in operation day and night for the next four or five days, while the panda wandered in and out, and finally it appeared to be perfectly adjusted to the cold.

Whether this single experience taught it what water is, and where it is in this particular enclosure, we don't know; at any rate, the panda has not been seen to get itself wet a second time and it probably learned how to distinguish water from land in that one not-so-easy lesson.

Demoiselle Cranes are another species that make certain of the adjustments to captivity perfectly well but are backward about others. Ice in no way enters into the experience of Demoiselle Cranes, for they breed in Central Asia, winter in India and Africa, and apparently they know nothing about a surface that looks hard, feels hard—at first—and suddenly lets you down. Demoiselle Cranes in the Zoological Park run out of doors all winter, with shelter for periods of really disagreeable weather, and some of them have access to a small pond near the Zebra House. At times when the temperature is cold enough to produce a thin coating of ice the keepers must keep an eye on the cranes; they will walk out fearlessly on ice just heavy enough to bear their weight, come to a thin spot, and plunge in. Cranes can swim quite well and there is no danger of them drowning if they get into deep water, but there is no way of swimming out of broken ice and a crane that has fallen through usually has to be rescued by a keeper. In earlier days we sometimes lost cranes that walked out on the ice of the Wildfowl Pond, but now we lower the water level in ponds to which the birds have access in wintertime. Being long-legged, they can at least wade out if they break through.

Demoiselles never seem to learn that ice can be dangerous. One might expect a succession of newcomers to break through, once, but veterans of many winters go on walking and breaking.

Species experience exerts a tremendous influence in the lives of animals, and we see it at work sometimes in the flocks of Starlings that pass through the Zoological Park. Their original home is Europe and although they are accustomed to cold, it is moderate cold and seldom as extreme as they are likely to encounter in this area; in Europe they migrate principally in an east-and-west direction, moving to milder climates in the cold season.

Here it is not uncommon to see whole flocks of Starlings bathing in running water on bitter cold days — the water, of course, being warmer than the surrounding air. Unfortunately for the Starlings, after bathing in the (comparatively) warm water, they will fly to a bush to preen. And if, as is often the case, the air temperature is below freezing, it is not long before ice begins to form and the birds that have not managed to dry their feathers quickly discover that they cannot fly . . . some are so iced-in that they can literally be picked off the bush.

Black Swans from Australia and Black-necked Swans from southern South America, where they have not encountered full icing conditions, will

stand patiently in freezing rain in the Zoological Park until their feathers are completely iced over.

The breeding periodicity of some creatures causes trouble when they are transported to a different hemisphere. Emus, for instance. In their native haunts in Australia, where the seasons are the reverse of ours, their breeding season is the warm months. Here, where December and January are seldom even mild, Emus lay their eggs on schedule — in a snowbank, if a snowbank is handy. The fact that it is the beginning of winter makes no difference to the bird, but it does to the staff of the Zoological Park if it wants to hatch and rear young Emus. In the days when we usually reared two or three striped Emu chicks every year, keepers had to maintain a constant lookout for eggs on the frozen ground or in the snow during the breeding season.

Emus, incidentally, are prime examples of the adaptability of warm-climate birds to the New York winter. They seem indifferent to cold and snow. General Curator Crandall recalls in that connection an Emu that came to us from California many years ago. It had been hatched in the San Diego Zoo and had never known cold weather. At the time when it came to us, late November or early December, the weather happened to be reasonably mild and the bird was turned out with no misgivings about its being able to adapt itself to our climate; before really bad weather came, we figured, the Emu would be well toughened.

That night a foot of snow fell.

Mr. Crandall skimped breakfast the next morning in order to hasten to the Zoological Park to see what had happened to his tender new Emu.

The bird had been given the run of the big field south and east of the Wildfowl Pond and this morning it was an unbroken sheet of whiteness, with no sign of the Emu. A smooth blanket of snow stretched on and on, quite level except for a single mound about the size and shape of an Emu's body. . . .

Remorsefully, thinking of the miserable death of the new bird, Mr. Crandall scuffed through the field and began to scrape the snow away from the mound. A startled and perfectly comfortable Emu sprang up, whirling snow in all directions, and ran off. After that we never worried much about our Emus in wintertime.



After General Curator Crandall learned that an Emu is perfectly comfortable in heavy snow, winter scenes such as this were common in the Zoological Park; the birds "wintered" out-of-doors.

He Had an Umbrella Bird in 1909

If Charles Cordier, our animal collector, does manage to come out of Ecuador this spring with the Eastern Umbrella Bird, it won't technically be the first time this strange bird has been seen alive outside its native haunts. But, on the authority of a curious little exchange of notes and letters published in 1909, we can be rather sure that it will be the first Eastern Umbrella Bird *on public exhibition.*

In the January-February Animal Kingdom we reported the general Umbrella Bird situation. There are three known forms:

1. The Bare-throated Umbrella Bird. First brought out alive by Cordier in 1942 and now on exhibition in our Bird House.
2. The Long-wattled Umbrella Bird. Never before brought out alive, but Charles has four fine specimens at his base in Quito.
3. The Eastern Umbrella Bird. Never publicly exhibited alive; Charles is now searching for it on the eastern slope of the Andes.

The Eastern Umbrella Bird is different from the other two forms in a number of striking ways. If Charles captures it and brings it back, we will be able to show all three known forms simultaneously — a prospect to make any zoological park curator's heart beat a little faster.

But, as we say, it won't be the first time this particular bird has been seen alive outside northern South America; in 1909 Mr. H. C. Molineaux had a specimen in England. That much is on the record, but he made sure that it wasn't publicly exhibited!

When the matter of sending our animal col-

But the fortunate English aviculturist made sure nobody else would see his great prize from Ecuador.

lector to Ecuador in search of Umbrella Birds came up several months ago, General Curator Crandall delved in his capacious memory and came up with a recollection that there had been a reference to a living specimen in *The Avicultural Magazine,* a British publication, some time in the first decade of this century. There is a complete file of that journal in black morocco ranks in the General Curator's office and a little searching turned up the reference.[1]

"A Notable Importation," it was headed, and two short paragraphs were signed "F. F.," the initials of Frank Finn, a well-known aviculturist of the day.

Here is Frank Finn's note:

A NOTABLE IMPORTATION

According to information in *Cage Birds,* (September 4th, p. 129), there has recently appeared a specimen of the Umbrella Bird of South America (*Cephalopterus ornatus*), which has passed into the hands of a private aviculturist, Mr. H. C. Molineaux; unfortunately this gentleman has stated that he has no intention of showing it, a resolution which most aviculturists will regret, as it is a most interesting bird, and has not, as far as I know, been imported alive before. It is about the size of a Rook, glossy black, with a large expansible crest and a pendulous feathered cylindrical wattle on the breast.

Belonging to the group of American Chatterers (*Cotingidae*), it is largely a fruit-eater, and ought to be easily kept. A specimen can be seen at the South Kensington Museum of Natural History.

F. F.

[1] *The Avicultural Magazine,* N.S., Vol. VII, No. 12; October, 1909.

The reference to a specimen in the South Kensington Museum of Natural History of course refers to a skin or to a mounted specimen.

This discovery in *The Avicultural Magazine,* with its reference to *Cage Birds,* whetted the General Curator's appetite for more information. The Zoological Society has for years maintained a subscription to *Cage Birds,* but it is a British trade publication with no interest beyond the moment and copies are read and thrown away. It seemed likely, however, that a back file would be available somewhere in New York.

It wasn't. Apparently the only file of *Cage Birds* in North America is in the Blacker Library of Zoology of the Redpath Library at McGill University in Montreal.

An airmail letter to Montreal produced a prompt response from Mrs. L. M. Terrill of the Redpath Library, in the form of a transcript of a note and a letter published in *Cage Birds.* The note was from the issue of August 28, 1909, and was by Mr. Finn.

"Was It Hatched in a Mare's Nest?" he asked in the title – rather flippantly and skeptically, it would seem.

There was a rumour going about the trade the other day that a specimen of the celebrated South American Umbrella bird (*Cephalopterus ornatus*), had been imported and sold for ten shillings to some fortunate individual, its first owner not knowing that he was entertaining an angel unawares, so to speak; but inquiries I made were not successful in revealing the whereabouts



Entitled "The Rare and Curious Umbrella Bird," this sketch by Frank Finn adorned his report in "Cage Birds." Apparently it was drawn from a mounted specimen, not from the living bird.



A much better drawing of the Eastern Umbrella Bird is this one, published in the "Cambridge Natural History" in 1899. It shows the wattle of the male in what we think, from skins in museums, to be about the true extended length.

of the treasure. As the bird has never, so far as I have heard, been imported alive, I may mention that in general appearance it is very like a thick-set Crow, being a big, glossy-black, strong-billed bird; but it is distinguished at once by the peculiar feathery tassel which hangs from its breast, something like the hairy tassel of the Turkey-cock, and by its peculiar crest, which spreads out on all sides when expanded, whence the name given to the bird. It is a fruit-eater, and ought to be easy to keep. Specimens are on view in the Natural History Museum at South Kensington, so that anyone living in London who wants to get an idea of what the bird looks like can do so. For those who do not, perhaps the accompanying very rough sketch may give some idea of the characteristic features of this strange bird, which would certainly make a grand show specimen, and beat anything at present likely to appear on the bench.

The sketch appearing with the article is given here. Its crudity indicates that Mr. Finn made the drawing from a skin, or perhaps a mounted specimen in the South Kensington Museum.

Frank Finn's brash headline drew a return stroke. In the September 4, 1909, issue of *Cage Birds* there was a letter to the editor from the owner of the bird.

The Captivating "Umbrella Bird"

Sir – In reference to Mr. Finn's article headed "Was it Hatched in a Mare's Nest?" I may say I am the purchaser of the "umbrella bird," about which there seems to be some doubt as to its existence. It is a fine specimen, and very tame, and is fond of custard. I purchased it from a dealer in London. I may add that it will never be seen on the show bench, so that the pot-



From "The Ibis," 1859.

Most impressive of all the Umbrella Birds is the Long-wattled, here illustrated. Our animal collector now has captured four fine specimens.

hunters need not think they may still win such prizes. I am always delighted with your paper, *Cage Birds*.

H. C. Molineaux.

Mr. Molineaux appears to have been a peppery individual with strong opinions about the avicultural "fancy" and the striving of his fellow-aviculturists to win trophies at cage-bird shows – that is the only explanation we can find for his reference to "pothunters" [i.e., cup prizes?]. At any rate, he made it quite clear that his Umbrella Bird was *not* going to be exhibited, and as far as the published record goes, he kept his word. Nothing else, so far as we can learn, ever appeared in print about the specimen of the Eastern Umbrella Bird that he acquired.

It will be noticed that Frank Finn referred to the bird as *Cephalopterus ornatus,* whereas the name as we use it today is *Cephalopterus ornatus ornatus;* in 1909 the bi-nomial, rather than the tri-nomial, system of scientific nomenclature was still widely used.

Having turned up these earliest references to the living bird, Mr. Crandall was curious to learn if anything could be discovered about its eventual disposition. Frank Finn died many years ago but David Seth-Smith (who shared the editorship of *The Avicultural Magazine* with Finn in 1909) is still active in British avicultural circles, and Mr. Crandall wrote him about our search, asking if he remembered any further details.

His reply ended the inquiry:

I remember hearing of the arrival of an Umbrella Bird but never saw it and am afraid the rather vague references you mention are all the history there is of it. I don't know who Mr. Molineaux is, or was. He was apparently not a member of the Avicultural Society and I am afraid it is impossible now to trace him if he is still alive.

So that is the end of the "paper hunt" for the Eastern Umbrella Bird. Of its habits in the wild or in captivity, nothing at all is known – except, as Mr. Molineaux said, "it is fond of custard."

We have hopes that Charles Cordier will bring back several specimens this spring and fill out the picture a little fuller.



In 1850 the Zoological Society of London published this picture of the Bare-throated Umbrella Bird, then a newly-discovered species.



What's YOUR Birthday Problem?

It is a fact, well known to parents, that children have birthdays. They also have birthday parties and if your child has a wide circle of birthday-party-giving acquaintances, you know too well what *that* entails in the way of return entertainment.

You also know the difficulties of planning a party that won't be essentially the same as all the other parties on your scion's social circuit.

Maybe we have an idea that you could use.

For the divertisement of the children of Members, and of the friends of Members, we are thinking of creating a Party Service that ought to take care of the Birthday Party Problem. Note that we're only *thinking* of it, at this stage; before going into the party business we want advice from you on the attached postcard.

This is the way it would work:

We would undertake to provide two to two and a half hours' entertainment at the Bronx Zoo for groups of ten or more children (accompanied, naturally, by a parent or chaperon). The groups would have to be restricted to children of 12 years or younger.

All you, as the sponsoring parent, would have to do would be to telephone the Zoological Park (FOrdham 7-2000) and ask for "Party Service." All the details can be arranged expeditiously by

telephone. We would want to know the day and the hour; tentatively, Birthday Parties will be limited to Saturdays – either morning or afternoon.

We would need to know how you are coming – by automobile, subway, bus or taxi – and thus at which gate you would enter the Zoo.

We would want to know the name, or nickname, of the child giving the party, so we could print up a special menu.

Say that you and your party of fifteen children arrive at the Pelham Parkway gate at 2:30 P.M., in three automobiles.

Parking space would have been reserved for you, the gateman would be expecting you and would turn your party over to a young woman especially trained to show children the animals most likely to interest them.

We are thinking of having one of these guides stationed at each of a number of animal houses – the Large Bird House, the Lion House, the Gorilla House, the Elephant House, the Children's Zoo and Riding Track. After making a tour of each building, the Guide would pass your party on to the next building's Guide, so that at all times your group would be under our care.

At the Riding Track, each child would get a ride on a pony and some other animal – a Camel or a Llama – and a visit to the Children's Zoo with all its petable animals. There would be a Tractor Train ride around the whole Zoo, and to wind up the afternoon a picnic at the Zoobar Restaurant, under the trees and across the path from the African Elephants, with the usual ice cream and cake, fruit drink and so on, all nicely printed out on a menu with a picture of a baby Chimpanzee having *his* birthday party in the Zoo.

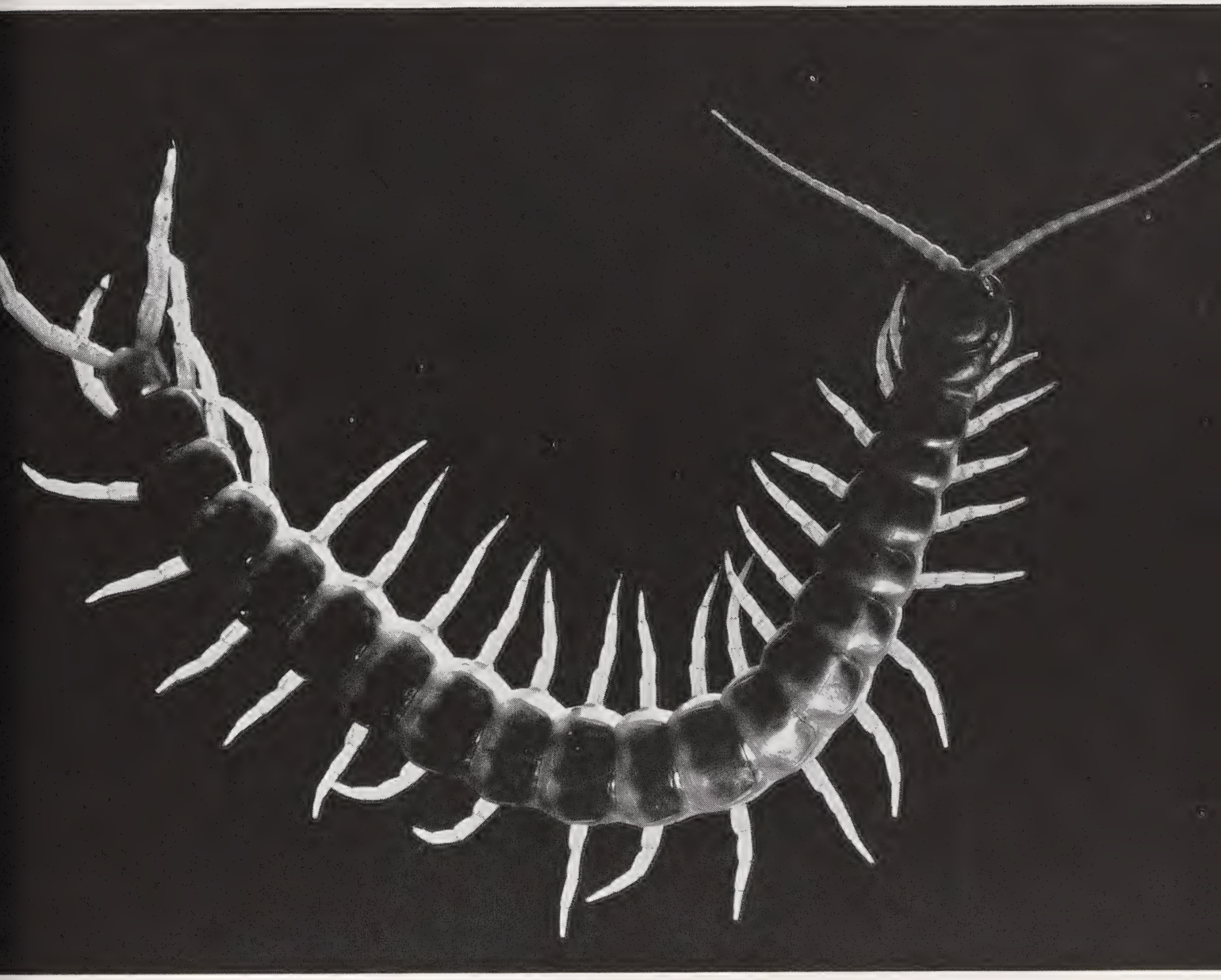
The tentative price of all this is $2.50 for each child, and $1.50 for each adult accompanying the party.

Now, the question is: does some such service as this meet a real need? The idea stemmed directly from one of our Members who, with three very party-conscious children, has run out of ingenuity in finding some kind of entertainment that her offspring haven't exhausted at the ten or fifteen other parties they attend each year. We are going to put on a special party next time one of her children has a birthday, using our existing Education Department facilities and staff, but the idea seemed so good and capable of so much extension that we thought maybe other Members, and the friends they might tell about it, would be interested. In that case, we would have to set up a special organization because the Education Department already has its hands pretty full.

We would like, therefore, to find out what our Members think about the plan. Obviously, you are not obligated by filling out and mailing the attached postcard (which doesn't require any postage). You aren't obligated, and we aren't either. If it turns out that the need for this kind of Birthday Party Service is limited, we couldn't afford to set up the kind of an organization that it would take to make the thing run smoothly and automatically. We would have to drop the idea.

It will be a very real help to us in our planning if you will use the postcard promptly. We will allow a few days for the returns to come in; then, to those who reply, we'll send a note saying whether the scheme is going to be put into operation, or isn't.

If it is, Birthday Party Service will be at your service starting Saturday, April 22.



This giant Centipede, approximately 7 inches long, came from Colombia and is now on exhibition in the Reptile House; its bite is poisonous.

NEWCOMERS

Photographs by Sam Dunton



Regarded not as a venomous reptile but merely as a living creature, the Copperhead has its points of sheer beauty. These two specimens, in a habitat cage in the Reptile House, have recently shed and their coppery markings are clear and bright.



Many a camper in the West has reason to distrust this inquisitive creature, for it is the so-called Pack Rat, or Trade Rat, that has a habit of raiding a camp and leaving a worthless scrap, such as a pine cone, for the objects it carries to its nest.



This unusual photograph of Bates's Serpent Eagle from western central Africa shows the eyes covered by the nictitating membrane or "third eyelid."

The Hoe and Yona

By WILLIAM BRIDGES

The Zoological Society's magazine is (and should be) primarily devoted to wild animal life. Now and then a collateral interest may find a place in its pages, for there are exceptions to the best of rules. "The Hoe and Yona" seems to be one of the exceptions.

In 1946 the author of this article went to the Belgian Congo to ship home three adolescent elephants presented to the Zoological Society by the Belgian Congo government, and after bidding our staff keeper and the elephants bon voyage he toured the Uele District of the Congo, there encountering what he felt was a significant development of colonial policy in regard to native agriculture. —F.O.

My friend Yona is a dirt farmer in the northeastern corner of the Belgian Congo. His homestead, or village, of eleven huts stands in the center of a five-acre clearing about a mile outside the white settlement of Kurukwata on the Aba-Faradje road. Yona is 41 years old but he shows few signs of age except good-natured wrinkles around his eyes and the corners of his mouth. His hair is still black and crinkly. He is rather short for a Logo tribesman, about five feet five inches tall. He professes to be a Christian and he has a New Testament in Lingala that was given him at a Protestant mission when he was a boy. He cannot read it. Nevertheless, the mission upbringing left its mark, for he is known to everybody as Yona, or John, instead of by his tribal name. Two of his eleven children have Lingala versions of Biblical names.

Yona's three wives are all good workers. His eldest son, now twenty, offended convention a couple of years ago by starting a family before paying for his wife, but that situation is being cleared up on the installment plan. Yona really has very little to complain about. He can meet his taxes and have a little left over; if the season is half-way decent, he can eat out of his own garden and fields and storage bins at least eleven months out of the year. In Yona's circles, that's Prosperity.

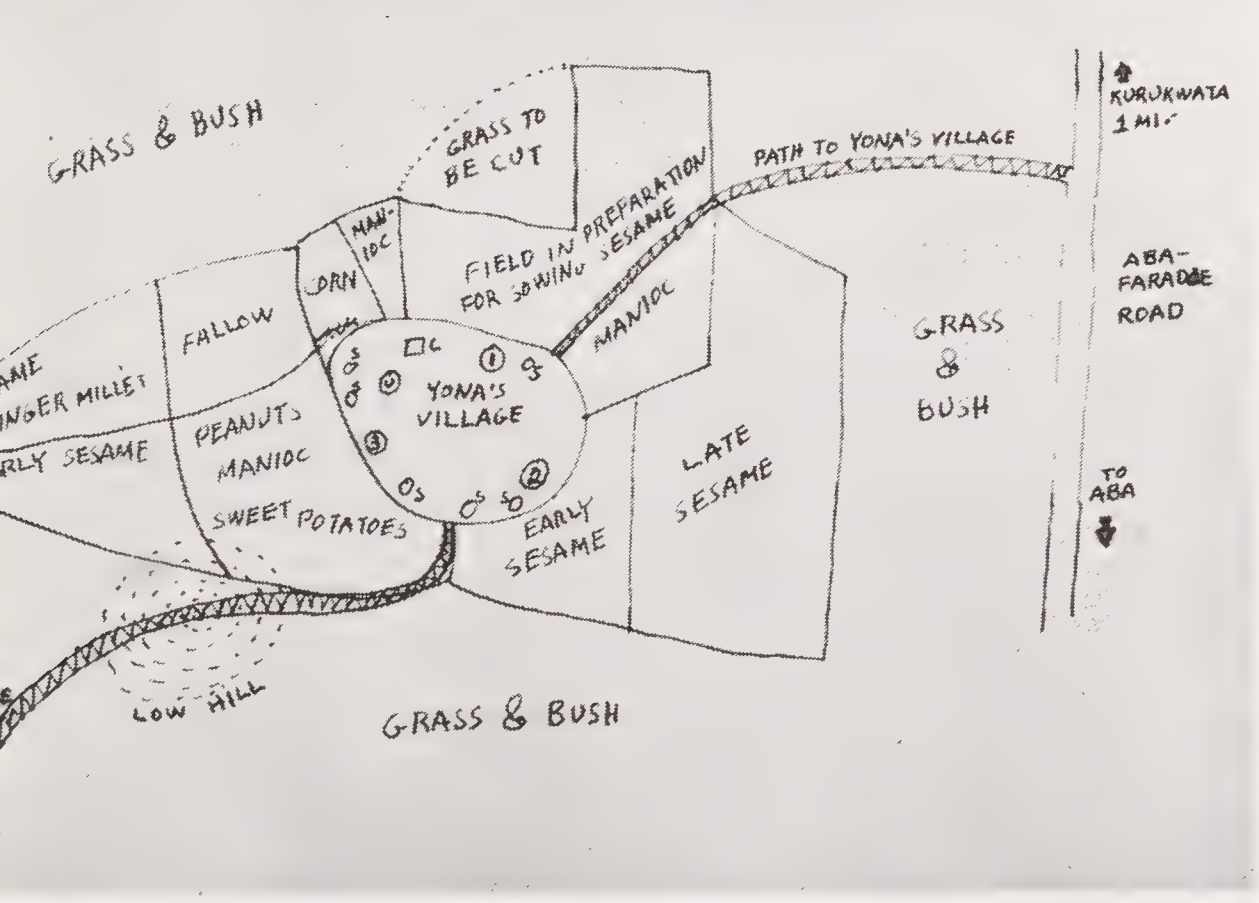
I wanted to meet a native farmer because I had read that wasteful practices are destroying the soil of Africa. Later I learned that it is not the subsistence farmer like Yona who is ruining Africa, but by that time it was too late to make an exhaustive survey. Anyway, the more thoughtful colonials are "learning to learn more from the natives," so Yona's style of agriculture may be important after all.

The Uele district where Yona lives is almost on the Congo-Nile watershed. Politically it is in the Congo and belongs to Belgium but climatically it is Sudanese and therefore it is dominated by a strong dry-season wind that blows down from Arabia across the Sahara desert. It is a patchy, uneven country, mostly savannah or bush-grasslands, partly gallery-forest along the streams, rarely heavy forest. Lions of the Sahara live side by side with Leopards of the equatorial forests, and Hippopotamuses and Giraffes do a Mutt-and-Jeff act on the same landscape.

Yona's tribe, the Logo belongs to the Moru-Madi linguistic group which is historically agri-



Yona's village—or homestead, since no one but members of his family occupied it—was an oval collection of huts surrounded by cleared fields.



ABOVE. This rough sketch gives an idea of the layout of the fields under active cultivation.

BELOW. Yona's shrine is the termite mound and sticks under the eaves of his First Wife's hut.



cultural and peaceful. Not being warriors by temperament and not being in competition with other tribes for the resources of their region, the Logos never developed the elaborate body of superstition and witchcraft that passes as religion with the more warlike and the pastoral tribes of Africa; the Logos have only a mild form of ancestor veneration.

Yona may be, as he says, a Christian – but he has an ancestor shrine in his village. Almost under the eaves of his First Wife's house was a weathered termite mound sprouting a couple of crooked sticks, and on the thatched roof above it were the skull and horns of an antelope.

I visited Yona's village with Pierre de Schlippe, at that time manager of the Compagnie de l'Uele's essential oils factory and coffee plantation at Kurukwata. Having known Yona for many years, he defied convention and asked Yona to show us his shrine. Yona wriggled in embarrassment for a moment and then nudged the mound with his bare foot. He picked up the skull, examined it as if he had never seen it before, and gave it a negligent toss higher up on the roof. All his children within earshot grinned and shuffled and looked away. I gathered that, without being really taboo, a shrine is something so intimate as to be almost unmentionable.

Yona explained about the shrine in a few words in Lingala. "He says this shrine is like a picture of his father and mother," de Schlippe translated for me. "His father was a great hunter and taught Yona all his skill, so when Yona kills an antelope he places part of it on the roof as a kind of thank-offering to his father. He doesn't really worship at the shrine – it is just something to remind him of his father, like a picture." The shrine is not a tomb, either; Yona's father died many years ago and is buried in some village long since abandoned by the family.

The peaceful Logos did not need an elaborate political organization and so they never created a system of paramount chiefs. Their utopia lasted until the white men came along toward the end of the last century and needed someone in authority to talk to. The white men seemed to set great store by chieftainship, so usually some better-fed member of the native community stepped forth and claimed to be the tribal spokes-

man; Yona says his grandfather was the first chief of the tribe, and de Schlippe is convinced that this is true – at least as far as the Lolia section or clan is concerned. There were other and perhaps greater chiefs, such as the Ogambi rulers who got their start in the middle of the last century by obtaining three rifles from Egyptian slave raiders. Anyway, the Logos have several chiefs now who are confirmed in their positions largely for the administrative purposes of the Belgian Congo government, and Yona's clan holds one of the chieftainships. In his way, he is an aristocrat.

Yona was born in 1907 in what he describes vaguely as "another village." Since villages are likely to be shifted every few years when the soil wears thin, and all traces disappear in a season or two, it is doubtful if he could recognize his birthplace. He married his First Wife, Robia, when he was twenty, and she has borne him nine children. Six sons and one daughter are living – Dramile, Kondjiwa, Manowa, Alitri Petoro, Anjualo (a girl), Isau and Dagwa. Robia worked hard and Yona prospered, so that in a few years he could buy a Second Wife, Adia. She has been productive in profitable daughters who will bring good bride-prices when they come of age. They are named Ruti, Sangoma, Agoyo and Tamara, the eldest eleven.

Yona's Third Wife, Dora, is an acquisition of the past two years and a serious disappointment. So far she has produced no children. Her relations with the other wives are good, however, and they all work harmoniously side by side. She seems to be an ambitious girl, too. I saw her once, in the middle of the morning and without any prompting by Yona, actually pick up some sticks and weave them into the roof of a half-finished hut. Of course, it may have been boredom rather than ambition.

Besides his wives and children, the only member of Yona's household is his cousin Djako, a stocky, happy-natured youth who came for a visit two years ago while convalescing from a burned back, and has never gone home.

Yona's village lies about a quarter-mile off the road. The land is rolling and would be considered open country when the pennisetum grass has been burned off in the dry season, but when the grass is tall it might as well be thick jungle, for a man cannot see more than a foot ahead. The trees are low and scraggly, scarred by fire, and the general effect is that of an abandoned apple orchard in upstate New York grown up in monstrously tall grass.

The approach to the village is along a hard-packed clay path just wide enough for one man to walk behind another – and both get soaked by the wet grass after a rain or before the morning dew is gone. About twenty yards off the road there was a box-like snare of branches and vines where the grass had been hacked away. De Schlippe said it was a trap to catch Servals, the long-legged cat of the region.

When we were out of the tall grass and wading through knee-high weeds, I asked de Schlippe where Yona's fields were. The homestead was just ahead, a scattering of low huts in an oval of hard-trodden earth, and around us there were only weeds, shrivelled trees, withered grass that seemed to have been chopped down a few days before, and islands of green pennistum.

"We're in the fields now," de Schlippe told me. "On the left is a patch of sesame planted in mid-August." (It was then mid-September.) "He's putting in more sesame and millet here on the right."

I couldn't see much difference between the fields, except that the débris in the new field wasn't quite as withered as the grass, weed-stems, sticks and clumps of grassroots in the older patch. Remembering the clean, fresh furrows in Indiana at planting time, I began to form a pretty low opinion of Yona as a farmer. All his fields looked like a weedy corner lot scuffed up by a gang of kids playing football.

De Schlippe must have known what I was thinking, for he stopped on the edge of Yona's sesame patch and gave me a lecture on African soils.

"Forget pretty nearly everything you know about farming in the temperate climates of America and Europe," he said. "Here you're almost on the Equator and these grass-matted fields are washed by tremendous rains and baked by the sun. They're swept by a withering dry wind for weeks. They're always threatened by erosion through wind and water.

"The whole soil-plant relationship is different here on the Equator. The mineral reserves are



Although he was a little shy about having his photograph taken, Yona posed with his First Wife after going into her hut and bringing out his best hat, decorated with monkey fur. His wife, Robia, holds the crooked stick with which the women work the field cover after crops are planted.

in the plants instead of in the soil. The soil lacks humus. Leaves, plant stems, fallen timber – all those things decay slowly in a temperate climate and produce a fine, rich humus. Here they rot completely and quickly, and consequently the soil is thinner and doesn't retain either water or mineral plant food well.

"When the cover is cleared off the soil, the rains wash downward and you get vertical erosion. The valuable elements of the soil simply filter out and leave laterite – you'll see lots of it in Africa, bare fields covered by what looks like red gravel. There are several theories as to how lateritization actually occurs, but the fact is that it *does* occur when this soil is uncovered, and a lateritic gravel bed is the end. It can't be restored to productivity.

"Yona keeps his fields covered all the time. He sows his seed right on top of the cover. You'll see his wives stirring the cover with crooked sticks to work the seeds down. So that's why this kind of agriculture that looks lazy and careless to you is actually the best thing that can happen to the soil."

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THE NIGHT FOG was still thick in the distant trees when we crossed the fields and entered Yona's village. He came out to meet us, standing stiff and expressionless until de Schlippe said a few words of explanation, then relaxing into a semi-military salute and a friendly grin. He was wearing a wash-frayed short-sleeved white shirt and a pair of faded blue shorts, the invariable costume of a country Negro prosperous enough to afford clothes. His wives and the younger children wore only a single patch of cloth before, a woven straw mat behind – some of the youngsters only a spray of leaves. I was chilly in a light wool sweater and a cotton windbreaker but the women and children seemed to be perfectly comfortable.

Yona's village is 170 feet long and 120 feet wide, a rough oval of bare black earth. Most of the huts hug the perimeter, leaving the center

clear for feasts, dances, goats and chickens. The wives' huts were distinguishable by their large size, the First Wife's on the right, the Second Wife's on the left, and the Third Wife's well separated, at the far end of the village. Half-way down the oval a tumble-down, squarish hut served as a dormitory for the younger children, and near it the gaunt frame of a hut awaited thatching and daubing when thatching grass was ripe; it would house the older children. Six smaller huts were merely storage bins for grain and peanuts, or sheds for the goats.

No fires were alight this morning despite the chill, but there were cold brands from old fires in Robia's hut and the thatch was stained a silvery-gray by the smoke. Country people like an inside fire and generally cook indoors even on a pleasant, dry day. The smoke doesn't seem to bother them.

With Yona's permission I pushed aside the lattice that keeps out the goats and chickens, and crawled into Robia's hut. There was not much to see, even with the aid of matches. The house itself is square, about 20 feet each way, and the roof slopes from a center height of 8 feet to about 5 feet at the walls. A smoke-blackened mud partition cut off a third of the room as a sleeping chamber. My last match went out before I finished inspecting it, but there seemed to be nothing but a pallet of hard, dry goat skins and grass mats.

The big room was cluttered with household gear — pots, mats, nets, spears, grinding stones, grass baskets. The floor was hard earth, of course, and very dusty. The only real article of furniture was a canvas-backed deck chair of flimsy construction.

In Robia's house and elsewhere under the eaves of some of the huts I saw brooms made of twigs bound with vines, but sweeping and dusting and general cleanliness have little importance in Yona's life. The center of his village was littered with corncobs and in wet weather the place must have looked like a pigsty.

"Yona lived here for the first time about twenty years ago," de Schlippe told me. "The ground wore out so he moved away in 1931 and let it rest. He came back in 1944 and he'll stay a few more years and then move on again.

"It was grown up in thick bush and grass when he came back. He and his neighbors hoed down the grass and hacked the trees down to stumps. As soon as they got a few sunny days to dry the stuff, they burned over the whole area and then they hoed it a second time. They'd be having a constant battle with the grass, of course. Sesame and finger millet and sorghum have to be planted in June, July or August, during the wet season, so as to ripen in the dry season of December and January. This grass springs right up again after you go over it with a hoe or fire, and because Yona knows from long experience that it's bad to leave the soil uncovered, he would sow right in among the new-springing grass. Then he'd give it a third hoeing, to mix the seed into the soil and uproot some of the grass.

"About that time the women would take over, turn and tumble the grass with their crooked sticks, scrape it into piles and burn it.

"In a few more days the crops and the weeds have covered the soil. Yona doesn't spare his wives' backs, and they would be put to weeding, probably two or three times, but always they keep the soil covered with either crops or weeds, and thus they protect the earth against the rain and wind and sun.

"It would be a good thing for Yona's diet if he would plant fruit trees — mangoes and oranges, for instance. They do perfectly well here and I'm growing them on my plantation. But it takes about four years for oranges to start bearing and the termites will eat down Yona's house in ten years, so he doesn't think it's worth while. Besides, young fruit trees are a lot of trouble; the goats destroy them and it's a terrific job to fence the goats out. A good part of Yona's capital is tied up in goats. They're his only visible wealth, and although he gives a goat-feast to his friends and relations now and then, he likes to keep them around the village and he's always hoping to add more. He will, too — when his daughters grow up. He'll get a good bride-price in goats and hoes for them. They're part of his capital, and he'll be really well-to-do one of these days."

The sun began creeping through the fog a few minutes after 8 o'clock and Yona's family gathered for breakfast. One of the women carried out two pots of cold vegetable stew and



The first step in opening new fields to cultivation is to cut the tall grass. This is men's work, and Yona and his neighbors are hacking down the grass with native hoes, which are pushed like spears. The vegetation will be allowed to dry and then the field will be cleared by fire.

everybody dipped in with bare hands. It was the sticky remains of last night's meal. Country people seldom eat a warm breakfast.

After breakfast the children rinsed their mouths and hands from a gourd of water and began to scatter for the day's occupations. Scrawny chickens pecked at the gray dabs of stew left in the pots. One boy of about 8 stripped fibers from a leaf plucked out of the roof and began twisting it and rolling it on his thigh; it made a surprisingly neat and strong string. He tied a bent pin on the end and wandered off toward a brook a mile distant.

The older sons, with Yona leading the way, struck off to help the men of the neighboring village clear their fields for the late sesame. De Schlippe and I returned at 3:30 that afternoon and found them long since through work and enjoying a beer party. Nobody was tight, although de Schlippe assured me it is possible to get reasonably high on the soupy, light-gray ferment of crushed corn that they call beer. Yona politely offered me a gourdful of the stuff but it smelled so fearfully sour that I – just as politely, I hope – refused. Most of the women of the two villages had joined the party and were gossipping, plaiting straw mats and "setting" each other's hair in short, tight braids. They shared the beer as the gourd went round, and so did even the youngest children with the exception of babes in arms.

De Schlippe is a firm believer in the nutritional value of beer. "It's really a food, even though it is slightly fermented," he told me. "Some of the wealthier people live almost entirely on beer, and a few of the chiefs are notoriously tipsy all the time – for you *can* get enough in you to feel it. Some tribes make beer out of finger millet and sorghum, but corn beer is the standard drink.

"When you consider how poorly balanced their regular meals are a good part of the year, you can understand that beer furnishes some necessary vitamins. We white people ordinarily have



Weeds spring quickly after the grass is gone and seeds are sown among them, followed immediately by a superficial hoeing. Then Yona's wives begin their task of breaking clods and scuffing the soil to discourage the weeds while the new crop is getting a good early growth.



For a man of high standing, like Yona, neighbors often do much of the preliminary work in the fields. In payment, he may give them food or a beer party, like this one, after a morning's work.

a soup, an entrée, and a meat; they have two dishes for their main meal, one called *fufu,* which means 'flour,' and another called *poto,* which means 'skin.' *Fufu* may be cooked corn or finger millet, or sorghum flour or manioc flour. Manioc, incidentally, is what we call tapioca, and it's the poor man's food; it grows easily everywhere in the Congo. Boiled sweet potatoes are another kind of *fufu.* You can imagine that *fufu* isn't very tasty, and there isn't much variety to it.

"*Poto,* the second dish, can be any green vegetable prepared with oil or with some combination of sesame. It may be ground peanuts, or a stew of insects such as caterpillars or grubs or flying ants, or even real meat, if they've been lucky in hunting. It's rather a liquid sort of food, in contrast to the drier *fufu.*

"The government tries to get them to eat dried fish, but it is fairly costly, so most of them get along with *fufu* and *poto* – and beer.

"It's a subsistence-level diet; nothing more."

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I SAID EARLIER that some of the more thoughtful colonials are beginning to "learn to learn from the natives." Pierre de Schlippe is one of them; in fact, his ideas are getting strong support from agricultural officials in other African countries. He was in a good position to demonstrate and test his ideas because he had been operating a small, native-style experiment station for the past two years and for twenty years before that he had been absorbing knowledge of native agriculture simply because it interested him. His experiment station is a branch of the INEAC (Institut National des Etudes Agronomiques au Congo) which has stations all over the Congo. Like other colonial institutions, INEAC was called into being primarily to serve the big companies that exploit the Congo agriculturally or commercially. But more and more the main object of the scientists working for INEAC has become the improvement of native crops. INEAC's Kurukwata station takes the natives' social problems into consideration and is mainly a try-out field for native crops.

"The hoe," de Schlippe remarked one evening as we sat on the wide verandah of his house at Kurukwata, looking over a green lawn into a *carré* of virgin forest where Colobus monkeys were chattering and leaping through the trees, "the hoe is the symbol of African agriculture today. But the hoe can never produce anything but subsistence agriculture."

That I could agree with, after seeing Yona in action. About the best Yona could hope for was a crop big enough to carry him through the lean dry months, with enough strength and energy to plant again at the beginning of the rains.

"If we as Belgian colonials want to raise the native above the subsistence level, we must do four things," de Schlippe went on. "We must improve the varieties of present crops and introduce new ones. We must induce the natives to try proper rotation of crops – and that means a change from shifting agriculture as they now practice it, to sedentary agriculture. Yona, for instance, instead of moving on and building a new village every few years, would be enabled to stay in the one spot for his whole lifetime.

"Thirdly, we must improve the life of the natives by all the means made possible by sedentary living – better homes, better cooking and eating facilities, large-scale milling operations for his grains instead of the hand-grinding on flat stones, and so on.

"And, lastly, we have to introduce mechanization of agriculture – which involves the possibility of wearing out and eroding the soil, and which therefore has to be introduced cautiously and under governmental financing."

INEAC is already at work on de Schlippe's first condition for the improvement of native life. The Kurukwata substation's fields were planted in rows, all carefully ticketed and watched to see what new strains of sesame, millet, corn, pumpkins, beans, peanuts, sunflowers and so on are best adapted to supplant the varieties that the natives now plant.

"As a matter of fact," de Schlippe said, "the native varieties of sesame and finger millet are good – well adapted to this particular climate and soil. But you never know what you may turn up. We've isolated five varieties of millet here; over in the Sudan they have thirteen varieties under cultivation and if we get a strain that will mature quicker, and yield more, we'll gradually work it into the native fields.



M. de Schlippe directs native labor at the INEAC plant-breeding station at Kurukwata. In the foreground is a plot of Job's Tears (Coix Lacryma-Jobi), a cereal being introduced; at the left is sorghum, then a long strip of buckwheat, then cotton and experimental plots of bean varieties.

"Recently we've been trying out rice, but so far it's been only partly successful here. Sunflowers and soya beans are another experiment. The sunflowers grow all right, but the natives don't know how to utilize them – we have to teach them about new crops."

Corn is a comparatively new crop that *has* been adopted by the natives. De Schlippe thinks it came to the Logos about 1890, probably from the west shortly preceding the white man's occupation of the country. The early corn was smalleared and half-filled out, but about 1932 de Schlippe introduced white dent corn of really good stock. It was a failure at first – it ripened too slowly and got caught by the dry season. Even after they learned when to sow, there were difficulties and many a wife and many a grinding stone were worn out before they learned to soak the flinty kernels before grinding. But when the Logo women learned how to handle this new, big-grained corn the vogue caught on and now most Logo farmers plant white dent corn twice a season.

Proper rotation of crops is de Schlippe's second step in the advancement of the native.

"The kind of agriculture they practice now is always shifting and it means there's no real ownership of the land," he said. "A clan may claim ownership of a certain area, but specific fields within that area are simply lived on by members of the clan and the individual doesn't own the fields – only the crop he puts in. As he shifts his fields, his homestead shifts too. The question is whether we white men who have assumed responsibility for the native can organize a rotation of crops that will preserve the soil and make it possible for him to establish a permanent base of stone or brick houses. All sorts of good things would follow – assured drinking water in all seasons, an economic relation of the natives to roads and markets, permanent schools, labor-saving devices such as community flour mills, threshing machines, barns, silos and the like.

"But, of course, a transition from a shifting to sedentary agriculture brings up the problem of soil conservation. If you stay in one place and work the same fields, year after year, you are in danger of transgressing the natural control, which is the erodibility of the soil. That problem can be met by a succession of cultivation and fallow;

a simple rotation, but one adapted to the tropics. Grass, weeds and brush spring so quickly that a fallow doesn't lie fallow, in the European or American sense, very long. The uncultivated field is soon covered and protected. After a few years it reverts to its original type of vegetation, a grass bushland, and is then ready to be cultivated again.

"As for mechanization—well, that is an experiment that must be tried by the government. It is far too costly and experimental for individuals. Besides, it means compulsion of the native at first, for he likes his age-old methods. But by small-scale experiments on government fields, and a gradual introduction, I think it could be done.

"By all these methods – new and better crops, permanent, substantial housing and facilities, permanent occupation of the land with rotating and perhaps mechanical cultivation – by all those, we could raise the life of the native to a really high level and thereby justify our stewardship in the Congo.

"We have to realise that whenever these technical innovations are introduced, sociological problems will arise and will have to be solved. The native can hardly adjust himself to these changes without aid. The jump from subsistence-level agriculture to a money economy and mechanized cultivation is far too great to be accomplished by one generation of illiterate men left to the natural forces of offer and supply. A scientific approach will be needed. New social, legal and didactic forms will have to be moulded.

"One thing we must always remember: primitive native social forms are as inapplicable to the modern equipment we hope to introduce into Africa, as our own social forms that are typical of the temperate climate are inadequate for the tropics.

"Neither native customs nor the ideals of the civilized world will have the last word. Modern science and Mother Nature – nature as it exists in Africa – will be the moulding forces."

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In Africa you do not judge a native's prosperity by his money, but by the fullness of his belly. If he eats regularly, he is prosperous. Of course, whether or not he eats during the lean months *could* be determined by the money he can afford to spend on store food, but in practice very few natives have that kind of money and their cash balances are hardly more than a rough index of their money-making contacts with white men.

Yona is a good farmer, maybe a little better than the average. In bad years he might have to keep tightening his belt during April, May and June – if he had a belt – but he always manages to find something to go in the pot. In other words, Yona is a subsistence farmer like millions of other Africans and while the subsistence may be pretty thin at times, he subsists.

Financially he is doing all right, too. In 1945, the latest year for which I have his full records, his cash income was $18.18 and his taxes were $4.49, leaving him a cool $13.69 net.

Yona needs very few goods that he and his family cannot produce for themselves. The only "store" articles I saw in his village were a rusty single-shot gun inherited from his father, the white shirt and blue drawers that he and one or two of the older boys wore, two small tin spoons, three or four strings of tiny beads on the babies, and perhaps half a dozen iron hoes.

De Schlippe told me that during the year the bulk of Yona's spare cash would go for salt, palm oil, dried fish and soap – all small items, but the kind that steal away a man's fortune before he is aware of it.

In one of the Greek stores in Aba, some twenty miles distant but the trading post nearest to Yona's homestead, I made an inventory of the items most in demand. The prices in Congo francs I have changed into their equivalents in dollars and cents, at the exchange rate of about 44 francs to the dollar which was then current:

Albert cigarettes (the native's favorite)	$.09
Soap (a big, crudely-fashioned bar)	.045
Salt (2 pounds)	.055
Sugar (1 pound)	.125
Salted dried fish, each	.32
Earthenware casserole	.34
Granite-ware casserole	.98
Iron pot	1.36
Granite-ware washbowl	1.05
Blanket	3.37
Men's white shorts	.57
Men's white shirts	.91
Blue cloth (20 feet length) according to quality	3.34, 2.66
Gaudy cotton cloth (20 feet, for women's garments) according to quality	3.40, 3.18, 2.27
Hoe	.37
Machete	.59

Native-made knife, for household use	.045 to .11
Iron spearhead	.34
Ear-rings	.11 to .57

By careful management of his money Yona can get through the year easily, even treating himself to a new pair of drawers now and then. He is a prudent man, not given to wasting his money on his wives. At a dance where many of the women were swathed in blue cloth that had set their husbands back anywhere from $2.66 to $3.34, Yona's wives wore their everyday, birthday suits. They did not seem to feel any social *malaise* because they lacked party dresses; after all, the women dressed so fine tonight in blue cotton would be working alongside them tomorrow clad only in their skins.

His wives are Yona's chief source of income and even though they cost him triple taxes, they are worth it. Here is Yona's financial ledger for 1945:

Meat sold to workmen in the de Schlippe factory	$2.63
Food supplied to the workmen by Yona's wives during about 8 months of the year	9.53
Beer made by the wives and sold to the workmen	5.45
Cash crop (rice)	.57
	$18.18

Every native in the Belgian Congo pays a tax, however small – provided the government can catch him. With some of the forest tribes, such as the Pygmies, catching is impossible and they go tax-free. But the more sedentary people pay their small tribute and in return get very good government medical service, roads and supervision by a corps of territorial and district administrators that by and large are genuinely attached to the interests of the natives.

Taxes are not based on income but are a kind of poll tax. In Yona's district the base tax for 1946 was 68 cents a year on Yona himself, for the Colonial treasury, plus 20 per cent. for local improvements and administration – an additional 14 cents. Certain groups are legally exempt from taxes: persons suffering from sleeping sickness, elderly people who in the judgment of the administrator are beyond working, and men with four or more children by a monogamous marriage.

Plural marriages have always been the custom in the Congo and by the mild and gradual method of imposing extra taxes for extra wives the State has attempted to discourage the practice – a policy fostered, I suspect, by the missionaries. Yona's personal tax in 1946 was 82 cents, and each wife (in excess of the permitted First Wife) cost him 77 cents. Thus his total tax for that year was $2.36. The year before, in 1945, it had been $4.49, both the personal tax and the surtax for local needs having been unusually high. The taxes vary from year to year, depending upon the general prosperity of the region as estimated by the local tax official.

Yona would, I think, consider himself in really good financial circumstances if it were not for the problem of his eldest son. Dramile, now twenty years old, married a girl named Manjiwa from a neighboring village in 1945 and agreed to pay her father the bride's price of 10 goats and 20 hoes. It was an inflated price, but everything has gone up since the war. Inasmuch as Dramile earned only $22.70 for a year's work in Aba, and had to keep himself and pay taxes out of that sum, he found it hard to meet the installments of goats and hoes.

Dramile talked big at first; he had a fine job in Aba, he was making big money . . . and while he didn't have *all* the bride-price right at the moment, it was just a matter of a short time. . . .

The upshot was that Manjiwa's father took a chance and let the girl go to Yona's village for a week's visit, even though the bride-price was not completely paid.

Naturally, Dramile got her with child.

Manjiwa hurried back to her father's village and the old man flew into a fine rage and confined her to quarters until Dramile completes payment. The boy has no income now and Yona will have to help him buy goats and hoes. When I was in Yona's village, Dramile still owed three goats ($6.81) and six hoes ($3.40).

I am glad to say that Dramile is one goat and two hoes nearer his bride as a result of a little offering from the New York Zoological Society at the close of my visit.

News from the Conservation Foundation

"Resources Report to Industry" Is a Hit

SOME MONTHS AGO the staff of the Conservation Foundation came out with a book. It was highly colored and decorative. Those qualities, however, are expensive and this book was no exception. It was therefore restricted to a very small edition of only three hundred copies.

The book is directed primarily at a small and highly selected audience. It is a specialized presentation designed to convince a predetermined group of the necessity for industry to enter actively into resource conservation. It consists not merely of a lot of pictures and colored charts. It contains, too, a number of wholly new ideas and provides, we think, a new approach to resource conservation. After all, approximately fifty percent of American industry, whether measured by jobs, plants or product value, depends on the renewable resources for its principal source of raw materials. In addition, all industries use water, some of them in fantastic quantities.

Immense pains were taken to provide nothing but facts in as judicial and objective a fashion as possible. In many cases the only source of fact was the Government. In many cases conventional government statistics tended to conceal quite effectively the kind of facts we wished to uncover. At one point, indeed, we had to hire our own statisticians and send them into the Census Bureau to rework Federal Government figures.

As soon as the finished product came off the presses into our hands we realized that we had the tiger by the tail. Everyone who saw it liked the presentation — even the specialized group for which it was designed!

Then the New York *Times* printed the editorial reproduced below and the Foundation was in a jam.

The staff likes publicity as well as any one else and it wanted the whole world to know what it had done. Yet a large edition, capable of general distribution at a modest price, was impractical. The Foundation was, in fact, like a hen with a stolen nest — torn between the desire to cackle and the necessity to conceal.

The staff of the Foundation knew that the secret would have to break some time, but it was kept purely in self-defense. When it broke it was with a louder bang than could possibly have been hoped for. The Foundation was delighted, of course, but it was also embarrassed for there simply were not copies available to meet the sudden surge of demand by telephone, post card and letter from every direction.

The Library of Congress, for instance, asked for a modest ten copies, apparently unaware that it was already in possession of two. A newspaper owner in Chattanooga, Tennessee, requested a dozen and asked that the bill accompany them. A personal copy was sent to him, but no invoice. The presentation is not for sale and, in any case, the cost might have surprised him. We wish we could have satisfied the requests of all the people who were interested enough to approach us but stocks were down and copies must be on hand for the purposes for which the presentation was originally designed.

* * *

This is what the New York *Times* said in its editorial of February 9, 1950:

RESOURCES REPORT

In an easy-to-read booklet that ought to be in the hands of every progressive business man and industrialist in the United States (and Canada too) the Conservation Foundation has set forth clearly and succinctly some of the facts of life facing American industry. The booklet deals with the question of natural resources, particularly renewable natural resources such as water, forests, animals and soil. It shows how seriously they have been depleted by a careless and wasteful people, and it emphasizes a point that is even more important than the mere diminution of the nation's natural wealth. This is the fact that all these resources are interdependent, that

the destruction of one necessarily affects, whether in the short or the long run, the existence of all. And from this fact – what Fairfield Osborn, president of the Foundation and one of the foremost conservationists of our day, calls "the basic law of nature" – springs the fundamental truth that "all industry depends on natural resources, the source of all raw materials and power."

It is the purpose of the booklet to explain how vital an economic interest all industry – not merely such primary processors as, for example, the food, textile or lumber industries, but *all* industry – has in a positive conservation policy for this country. The Foundation does not overstate the case when it says that "conservation as a whole is the responsibility of the individual business man." There is not much doubt that unless considerably more aggressive steps are taken along these lines by private industry the Federal Government will inevitably have to play an ever-increasing part in what has become nothing less than a question of national self-preservation. This is true in respect to forest resources, soil protection, water supply, or any of the dozens of other facets of the conservation problem.

A few forward-looking industrialists understand the situation, but the mass of American business men still have to be awakened to the tremendous importance of conservation to their own welfare now and in the future, even though the problems do not at present impinge directly on them. That is a task which the Foundation has set before itself. In an effort to collect some much-needed basic data on certain aspects of our natural resources it is now engaged, with governmental cooperation, on the first comprehensive ground-water survey on a national scale ever undertaken. The Conservation Foundation may be small and youthful but it is nothing if not sturdy; and it seems to be fashioning some pretty solid slingshots with which to slay its mortal enemy, the giant of Indifference.

We realize that many members of the Society would be interested in this book. Some day, and we hope soon, the *Resources Report to Industry* will be available for wide distribution at a reasonable price which, by cutting corners, some think might be as low as $2.00. We want very much to have the book in the hands of as many people as possible.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

In Other Words, He Wants to Know Something About Bengal Tigers

Our Mammal Department is accustomed to letters requesting extensive information, but it seldom has had such a work-out as it is getting from a young boy in Connecticut. His two letters, addressed to the Bronx Zoo, follow; they are reproduced exactly as written.

Dear Sir:

Would you kindly give me some information? I would appreciate it if you would answer my eight small questions. Are Bengal Tigers found in all parts of India? Is the jungle of India as pretty as Africa? Are the trees as big as the ones in Africa? Is the jungle as dense? Has is got as many different kinds of animals and birds as Africa? Is there as many Bengal Tigers as there are any other carnivorous animal? Is there as many Bengal Tigers as there is any other different kind of tiger? How much of India is reserves? Thank you.

Yours truly,

JACK ———

P.S. I forgot to mention this up top. Does India have crocodiles, spiders, ticks, bugs and quicksand?

The Mammal Department made a brave attempt to answer the first letter, and apparently whetted the appetite of the youngster, for he composed the following:

Dear Sir:

Would you kindly give me some information concerning animals? Is there danger of a Bengal Tiger becoming extinct? Are they growing extinct rapidly? Are Bengal Tigers in very dense jungle or in grasslands? Are any parts of India unexplored? What part of India is jungle? What part is grasslands? Are there natives in India? Where is Bengal on a map? Are Bengal Tigers in all parts of India or just in Bengal?

Are there as many Bengal Tigers as there is wild boars? What parts of India is reserves? Can a croc. kill a tiger in shallow water? In deep water? On land? Are there Bengal Tigers in mountains? Would you try to tell me how many Bengal Tigers there are? Is a tigers growl as powerful as a lions? How large is India? Is all of India being modernized? When will the jungle of India be cut down? Will the people in India cut down the jungles? Will any other country come over and cut it down? When will it happen? Is Bengal mostly mountains? Do Bengal tigers live in caves? If not, where do they live? Are the jungles of India ex-



We Win a Safety Award

Largely as a result of the conscientious efforts of our employees' Zoological Park Safety Committee in recommending safety measures to eliminate hazardous working conditions, the Bronx Zoo placed first in its division in the New York State Insurance Fund's 1949 safety contest. More than fifty employee skills are required to operate the Zoological Park and to prevent time-consuming accidents among our 250 employees. – G. C.

---

pected to be cut down? When? Are there as many Bengal tigers as any other carnivorious feline?

Which of the types of tigers has the most muscles and the best build? Do Bengal tigers live in caves? If not, where do they live? If Bengal tigers live in caves that means that they would be near the mountains, doesn't it? Are the very small mountains just big enough for a cave? Are the jungles of India separated or are they in one bunch? Thank you.

Very truly yours,

JACK ———

P.S. I won't write to you any more because this answers about all of my questions.

Circumventing Sumaili

Our baby Mountain Gorilla, Sumaili, is still a resident of the Animal Nursery while awaiting completion of the Great Apes House this spring, and because of her gentleness and affectionate ways she is often given her liberty in the Nursery. That indulgence has frequently been abused, however; Sumaili is inquisitive and of an exploratory turn of mind, and is especially fond of turning off sunlamps, pulling electric cords out of their sockets, and turning on faucets.

Mrs. Helen Martini's ingenuity has been equal to the challenge, nevertheless. Sumaili is afraid of dolls – so Mrs. Martini bought a dozen plastic dolls, tied them at strategic points – and now it is perfectly safe to let Sumaili wander at will!

Two Swords Instead of One

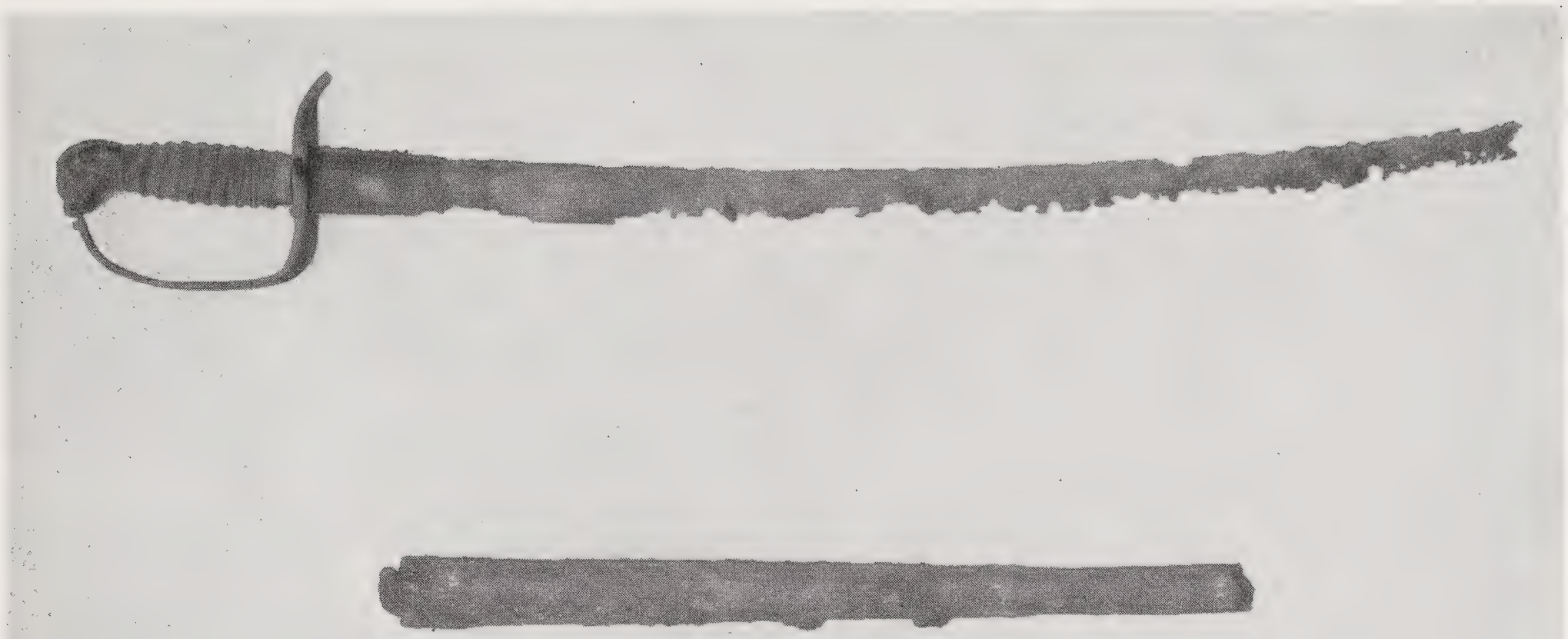
Many of our so-called fancy strains of domestic animals originally arose as abnormalities, or "monsters," as the embryologists call them. If their peculiarities turned out to be heritable and did not cause death, they could be perpetuated and subsequently modified by selective breeding.

In February the Aquarium obtained an aberrant tropical fish that once more brought this matter to the fore. This fish is a double-tailed example of one of the domesticated strains of the Swordtail. The lower half of the caudal fin is completely duplicated, and since the fish is a male it exhibits the striking character of a double sword. The anal fin is also doubled.

The question paramount in the minds of fish fanciers is whether this fish could be used to start a strain of double-tailed Swordtails. We are at present testing the fish with selected females to see whether or not his abnormality is inherited, although we believe the chances are that it is not. Dr. Myron Gordon, our geneticist, once had a similarly-formed female, and he genetically tested numbers of her offspring to no avail. The doubling of the tail was apparently simply an individual aberration and not a genetic one. Such characters *can* be inherited in some fishes, however, as in some goldfish, so we are continuing our breeding tests. – C.W.C. & J.W.A.



The double-sworded Swordtail.



A mere saw-toothed edge was all that was left of the blade found in the Great Apes House excavation, although the grip and guard were in excellent condition. The gun was badly rusted.

Somebody Dropped His Arms A Long Time Ago

Last fall while the foundations and moat of the new Great Apes House were being excavated, workmen turned up two rusty pieces of metal which, after preliminary cleaning, turned out to be a sword and what apparently was a section of a gun-barrel. They had been buried about five feet under the surface.

The two objects have been presented to The New-York Historical Society and Executive Secretary Tee-Van is in receipt of the following communication from Richard J. Koke, Curator of the Historical Society's museum.

"The rusted sword dates, probably, from the early 19th-century, and the other object, which we have been carefully cleaning, is the breech end of an old muzzle-loading musket, probably a flintlock. We have found the old touch-hole which pierced the barrel from the flash-pan to allow the powder inside the gun, behind the musket ball, to be ignited upon pulling the trigger. Some of the underpinning of the barrel is also in fairly good shape considering its long residence underground. The gun must have been dealt a terrific blow to become broken and dented as it is now.

"Outside of this, one cannot say too much. Both pieces undoubtedly were once associated with each other, and the date would be, probably, some time in the early 1800's."

New Leaflets Available

Because of the many inquiries received by his department on the habits and care of the so-called "chameleon" (*Anolis carolinensis*) commonly sold at circuses, pet shops and the like, Curator Eddy has prepared an informative mimeographed leaflet for free distribution.

He has also drawn up a check list of all reptiles and amphibians found in New York State — another subject that produces many inquiries.

Present from Dr. Beebe

A magnificent specimen of the Bushmaster of Trinidad and northern South America came to us in March as a present from Dr. William Beebe, who is now at the new station of the Department of Tropical Research at "Simla," in the Arima Valley of Trinidad. The snake is between six and seven feet long and is in excellent condition, although Dr. Beebe had not succeeded in getting it to feed and the same difficulty has been encountered since its arrival here. The snake came by air, securely crated, and arrived on March 8.

Bushmasters (*Lachesis muta muta*) have been recorded to a length of 11 feet and thus our new specimen, while far from the record, is of very respectable size.

PUBLICATIONS OF INTEREST

BARNEY. By Esse Forrester O'Brien. 64 pp., 22 photographs. The Steck Co., Austin, Texas. $1.50.

An authentic story of the adventures and misadventures of a bear cub born under the cafeteria floor at the Old Faithful Lodge in Yellowstone National Park and reared, for the first year, in the home of the Assistant Park Naturalist. Barney subsequently passed into the custody of the Superintendent of the Grand Teton National Park and was well known to tourists. An inquisitive bear cub can get into, and cause, a considerable variety of trouble and Mrs. O'Brien has many amusing stories to tell. For children up to the age of about 10.

WEBS IN THE WIND. By Winifred Duncan. 387 pp., 101 figures, 74 black and white plates. The Ronald Press Company, New York, 1949. $4.50.

The high adventure of playing Peeping Tom to a variety of spiders at Cape Cod, Massachusetts, and Cuernavaca, Mexico, has been granted to Winifred Duncan. With rare perseverance and minute attention to detail, she has for two years spied upon their love life, their engineering feats, their trapping and hunting skills. The net result is a first person narrative, told with enthusiastic simplicity admixed with diary notes, which is remarkably revealing. Countless drawings, executed with due care by the author, help in bringing conviction to the printed page.

It is rather startling, however, to find so much space in *Webs in the Wind* devoted to appraising the observations of other writers. While bemoaning their use of formal scientific language, she often employs it with unorthodox interpretations. Many of her observations are most worthwhile, but they lose much of their value because 16 of the species under discussion are not identified.

Any book publicized as belonging to The Humanizing Science Series is expected to be anthromorphic. This book is no exception. It provides information on many arthropods besides web spiders. Frankly written for popular consumption, it is unique in furnishing a list of research points, a glossary, bibliography, and an abundance of excellent original drawings. — Brayton Eddy.

BIRDS' NESTS: A FIELD GUIDE. By Richard Headstrom. 128 pp., 61 photographic illustrations. Ives Washburn, Inc., New York, 1949. $2.75.

When autumn winds have stripped the leaves from woodland and roadside trees, deserted bird nests, pathetic reminders of the happy songs of the long-past summer, are easily observed. Usually such nests arouse only wistful smiles and mild feelings of depression. But Mr. Headstrom's little book brings awakened interest, for with its help these nests can be identified with reasonable accuracy. Hunting through extensive texts for nest descriptions, given casually under species heads, has never been an inviting task. Now, with the help of a well-plotted key, any nest can be assigned to its proper builders in no time at all. "Birds' Nests" should implement a fascinating off-season interest for bird students.

— L.S.C.

New Members of the New York Zoological Society

(Between January 1 and February 28)

Life

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William Lynch
Mrs. Walter W. Naumburg
Christ G. Papalexis
Miss Cynthia W. Sterling
Robert Winthrop

Contributing

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Mrs. Alfred B. Ayers
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E. J. Stubbs
Lewis E. Weaver
Mrs. Margaret E. Weaver
Mrs. M. Zelker

It's a little early

to be thinking about it,

but—

are you going away this summer?

IT'S NO TROUBLE at all for us to arrange to have ANIMAL KINGDOM and other communications from the Zoological Society follow you *if* we know where you're going.

For instance, maybe you go to your summer place about June 1. If our mailing department doesn't know about it, you might miss getting an invitation to the opening of the new Great Apes House, the Spring Garden Party, and the return of the Cordier Ecuadorean Expedition.

So if your plans have crystallized (or *when* they crystallize), please send us a postcard telling:

1. Your summer address.
2. When you're going.
3. When you're returning to your regular address.

We will take care of the rest of it without any fuss or feathers.

MEMBERSHIP DEPARTMENT,
The New York Zoological Society,
The Zoological Park,
New York 60, N. Y.

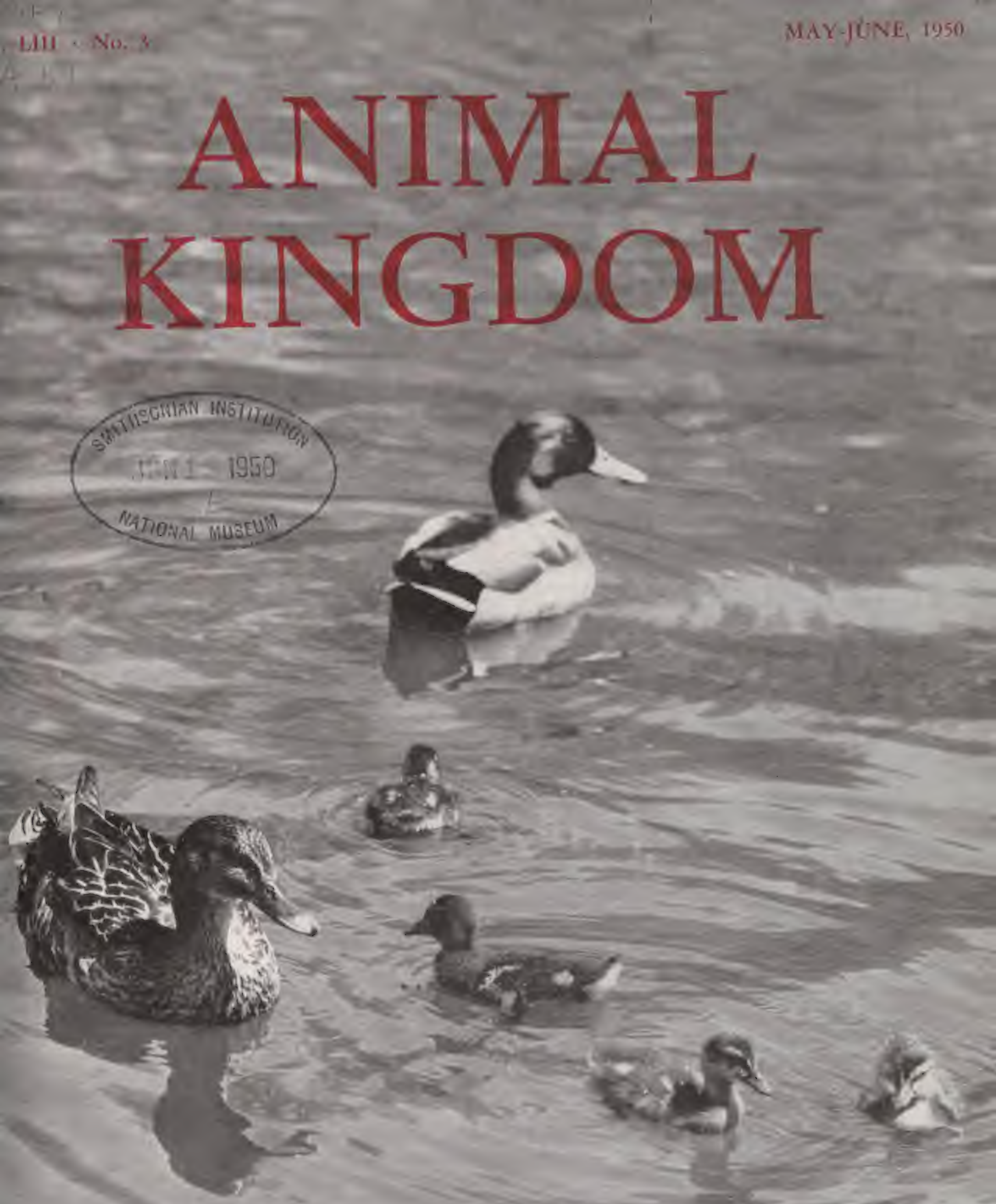

NEW YORK ZOOLOGICAL SOCIETY

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MAY-JUNE, 1950

ANIMAL KINGDOM

SMITHSONIAN INSTITUTION
JUN 1 1950
NATIONAL MUSEUM



THE MAGAZINE OF THE NEW YORK ZOOLOGICAL SOCIETY

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ANIMAL KINGDOM

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Personalities

WE ALL HAVE WONDERED at times why it is that people vary so much in their dispositions and natures. Such variations are not peculiar to human beings and are indeed observable in virtually all kinds of animals. The observation of variations in personalities of animals has a zest of its own. Probably the most rewarding practice is observing the intimate lives and actions of animals in their wild state but lack of time or opportunity denies this possibility to most people.

For one who has for many years made a practice of keeping a few birds at home, the study of their varying dispositions is always fascinating. In most cases the timorousness which is common to the majority of birds gradually disappears through familiarity with human beings. It is then that the differences between individuals within the same species become most apparent. Further, some groups such as the Bulbuls and Toucans make entertaining companions, gay with just a touch of impudence. Others, however, such as the Golden-headed Ground Thrush of India or the Blackcap Warbler of Europe, Asia Minor and North Africa, remain aloof or shy and do not easily become "one of the family," so to speak. Many of us are familiar with these diversities in our native birds, which range in their dispositions from the cocky manners of the Catbird, the Towhee or the Blue Jay to the *wild* quality and remoteness of many of the thrushes and warblers.

Often these variations can be explained by obvious conditions of environment or manner of living. But many differences are virtually inexplicable and certainly cannot be identified with environmental influences, or solely therewith. All in all, the study of animal personality or psychology offers unlimited possibilities of interest. Animal behavior is a field of study in which our institution has been engaged in recent years and one in which we hope to do far more as time goes on.

Fairfield Osborn

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JUN 6 - 1950

JUNGLE VIEW

Newsletters from Our Trinidad Research Station

By WILLIAM BEEBE

Since opening the new station of the Department of Tropical Research in Trinidad early this year, Dr. William Beebe has sent monthly Newsletters to the officers and staff of the Zoological Society. Extracts from three of the Newsletters are presented here because they reflect, perhaps better than a more formal article, the gradual coming-into-being of a smoothly-functioning jungle laboratory from which valuable scientific results may be expected.—EDITOR.

ON JANUARY SEVENTEENTH we landed at Port-of-Spain and three hours later started for Simla; Jocelyn Crane and I doubtful that it could be as wonderful as we remembered, and Laura Schlageter and Henry Fleming rather disbelieving that it was as perfect as we had described it. An hour's drive brought us to its three castellated battlements and terraces, its great mountain views in every direction, its great living room waiting to be metamorphosed into a laboratory—and all scepticism vanished. We had climbed the winding road in a tropical downpour. As we came out below the outermost wall, the sun broke through, three House Wrens sang at once, and a double rainbow sprayed the valley with infrared and ultraviolet. We would not have been human if we had refused to recognize omens.

We started work far up the crest of East Mountain where our parent spring gushes forth from beneath gigantic boulders. The receiving tank and outlet had to be cleared and cemented clean. Then the three-fourths-mile of pipe must be flushed free of residue. This work Henry Fleming and his native helpers found difficult, for it is cruel to have to busy oneself with plumbing while a heaven-blue Morpho flies past, an unknown bird sings close at hand, or an orchid with flower stalk of sheer loveliness overhangs the pipe itself.

Our particular researches have so far been sporadic. We have not dared to start anything in earnest until our physical environment and needs are settled. But we have welcomed occasional interruptions due to visits from friends and strangers vitally interested in Simla and our plans.

On January thirtieth our new artist, Douglas Boyden, arrived by plane, and slipped quietly into place. On the eighth of February Jack Dunning came, a fellow member of our Society, and a master bird photographer. For five days we spread an avian film feast for him. The very first day our pet Ruby-and-Topaz Hummingbird posed with wide-spread amber tail on an accessi-

Photographs by Jocelyn Crane.



ble twig of an orange tree, and will probably be seen at the next Annual Meeting of the Zoological Society.

On the twenty-sixth we had our first jungle baptism of an army ant visitation. Jocelyn looked down and saw beneath her table a semicircle of the ominous vanguard already in the laboratory. I had to make a quick decision: to let them come in and rid the house of every bothersome insect, or fight them. We had many filled and unprotected terrariums, we had a bushmaster which I did not like to shift, and it was near dinner time. We might have to spend the night on water-moated chairs or on one of the terraces. So I chose to fight. Four of us with kerosene and flit guns, brooms and brushes waged combat for two hours before we turned the tide back into the jungle. Our pet House Wren with nest in the rafters of the laboratory looked on and sang hysterical encouragement. She well knew that her infants would not last five minutes had we let the army advance. Only last month, a native baby in its crib, further down the valley, was left in charge of older brothers, and was eaten alive when they deserted. There is something terribly inexorable about the blind, vital hordes. Dr. Schneirla, when he comes, will find more than sufficient grist for his scientific mill.

* * *

Any practical, well-thought out venture should move slowly, from phase to phase, gradually completing the first, and logically beginning and finishing the next—and so on. To open a new, permanent Field Station for the Zoological Society one has only, first, to make adequate purchases and preparations based on more than ample experience; second, to pack and transport these impedimenta to the chosen place; third to install them and start the machinery going for living—the facilities for eating, sleeping and remaining in health in jungle isolation. The fourth and final phase must provide satisfactory oppor-



In typical Trinidad style a crew of helpers carried the Department's impedimenta up the hill and into the new station.

tunity for scientific observation and study, aided by photography, painting and writing.

All these clear-cut ideals have been accomplished but sadly jumbled by overlappings, lags and even anticipations. Take, for example, the greatly desired Bellbird which broke its neck flying against a wire so inconveniently soon after our arrival. I was compelled to sit down amid a mountain of unpacked luggage, to skin the bird with a pen-knife and prepare its syrinx for future study in a vial of the best rum. So this report will have for its material a melange of displaced happenings. The orderliness, so beloved of scientists, has given way to delayed items of Phases 2 and 3, together with exciting previews of Number 4.

We have so far resisted the temptation of any extensive trips, although from the crest of the pass a few miles up our road, Tobago is in full view. Mr. Dunning, before he left, flew there in twenty minutes, and saw birds of paradise, besides nesting Boobies and Man-o'-war Birds. To the west of Simla, and much nearer, are clearly visible the mangroves on the coast of Venezuela with Sun-bitterns, Finfoots, and the flocks of Hoatzins, whose forebears we photographed forty-two years ago.

A week ago we drove to Manzanilla Beach an hour away, and discovered a new suburb of Simla. Eight lines of rolling breakers crashed upon a vast expanse of sand, from which in shallow water we scooped forty-five thousand chip-chips—native name for the most delectable of mollusks in the world. Besides their edibility, the tiny shell of each reflected various mosaics of a rainbow.

Around our feet flipped the familiar but forever strange Four-eyed Fish, with half an eye for water, and the other half for air. Farther down the beach there emptied a sluggish stream abounding in Seacows. When our New Aquarium (*deo volente*) desires a Manatee, it is here for the taking, a proceeding no more difficult than rolling a gasoline barrel out of a brook.

When we first sat at our tables in the laboratory conditions seemed ideal. The far-flung eaves kept out all direct sunlight and blocked the most driving rains. But zephyrs and high winds were not stopped by wire netting, and so we had to install glass at considerable expense. This is an example of the need for pragmatic experimentation in various situations.

Two great storage water tanks were built for us late last year by our kind neighbor Dr. Wright, but to the present both refuse to hold water because of the loosening of foundations by the unprecedented rains. Elswyth Beebe is rejoicing in three feet of snow in Vermont, after an open winter, insuring an abundance of maple sap. New York is apparently still praying for rain. We planned this first visit to coincide with the dry season. Whereupon January saw a downpour twelve times normal. Now we are half through the dry season with an average of six

heavy showers a day. This upsets not only decades of Trinidad's meteorological records, but affects our plans for ultraviolet photography and prolonged observation. As is always the case with the business of a naturalist, a surfeit of rain-induced problems is automatically ready to hand. For a scientist, the dice of productive opportunity are always loaded.

In spite of the rain Henry Fleming has begun exploring the adjacent mountains for caves, and his preliminary trips have revealed curious bats as well as roaches and other insects. Hours in sodden clothing dampen even his enthusiasm. I have had about a half mile of trails cut through the woods around Simla, and fifteen minutes to a half hour provide material for an entire day of dissection, painting, interpretation of new facts and eternal discussion. The laboratory is now hatched and quite dry behind the ears, with every facility as in our blessed Zoo laboratory.

On one walk within sight of Simla, a something crept toward me through dense underbrush, and I lamented the lack of a snake stick, until a timid, wee Agouti infant suddenly broke out, dashed between my legs with a squeal of terror and fled uphill. A few meters away, two days before, an Ocelot stopped to look at me, and before he sprang into invisibility dropped something. This proved to be the hind quarters of a Mongoose, animals which are all too numerous and destructive.

Even a superficial view makes it apparent that the ecology of Arima Valley offers diverse tempos of behavior. For example, the Bellbirds are in full cry four miles up valley, whereas they are still silent at Simla. The giant black Caciques with us have ceased their daily migration to a distant roost and are in full swing of nesting. To the north they are still migrating daily.

We have obtained an interesting collection of the animal life living in giant bromeliads which are found only near the summit of Trinidad's second highest mountain, El Tuchuche, three thousand feet up. This plant has the overpowering name of *Glomeropitcairnia erectiflora,* and its flower stalk is scarlet and as coarse as some strange, Devonian plant. Among the organisms is a golden frog, a giant roach and a scorpion found nowhere else.

Comedy entered our lives with the arrival of a Capuchin Monkey—Chiri Number Eight if I am not mistaken. We welcomed him to the usual official office of Taster-in-Chief-for-the-Advancement-of-Knowledge-of-Warning-and-Protective-Coloration. So we smugly decreed, but Octachiri had another mind and discovered a loose nail in the door of his cage. When last seen, he was loping on three legs through the branches of a mango, hugging an unripe orange to what corresponds to a Capuchin's bosom. Next day he appeared at the house of our only neighbor, a full mile away. The following day he returned, filched an egg from a heaping basket, and having cracked it, perched upon the roof of the kitchen,



Settled down and hard at work in the Simla laboratory. L.-to-R.: Henry Fleming, Dr. Beebe, Miss Crane.

happily sucking yolk. For all the world, he looked like a miniature gargoyle in the guise of a defrocked Capuchin monk, blowing up a football. Although in full liberty, he refused to leave and awaits, though he does not know it, the moment when we need his services. A little hunger, a small banana as bait, a quick grab at his tail, and he will be in the employ of the New York Zoological Society. Except for an indefinable alteration of expression he might be the very incarnation of all seven prototypes; an imp, unpredictable but wholly lovable, who will surely win our affection in association, and wring our hearts at parting.

* * *

Until now, the writing of these reports has been comparatively easy. The chief effort has been to choose between the multitude of happenings during preparation, transportation and settling down. The last month, March 15 to April 15, has been a transition one, a fifty-fifty division between final practical arrangements and the beginning of research — the raison d'être of the Station. The generator is still being coaxed into efficiency, heavy power wires still drape the laboratory, like lianas in the jungle.

Our evolution in illumination will stand as an example of the same thing in other departments. It is a recapitulation of mankind's use of fire and light since early Stone Age. The first arrival of our car at Simla at night was greeted by the caretaker holding aloft a smoky, resinous torch of burning sap wood. For a time we peered about by the tremulous flares of candles. Next came old-fashioned oil lamps, and the graduation to most brilliant and effective pressure kerosene and gasoline lamps. Finally we entered the age of Edison-plus and at the very first rumble of our renovated generator, at Henry Fleming's magic, the whole building sprang into concentrated glow. The outdoor column lights now attract multitudes of beautiful moths and other insects, and indoors our microscope and photographic bulbs enable us to appraise and record the colors and activities of nocturnal vistors. One evening we fashioned a throw-back to pre-torch forebears and imprisoned a sufficient number of giant fireflies in a glass to read their scientific names in quite small print.



Jack Dunning arrived with his camera and the department "set an avian feast" for him, with a Ruby-and-Topaz Hummingbird perching conveniently near-by.

Reporting on the beginnings of scientific research is a much more difficult matter. What we hope to achieve would make vague and meaningless reading; and definite results, especially in our new fields of endeavor, are not to be expected in a day or month. As a place for sheer observation lists Simla has already surpassed expectations. In our immediate environment we have observed every species of mammal found in the whole of Trinidad in the families of monkeys, squirrels, agoutis, porcupines, ocelots, mongoose, raccoons,

deer and armadillos, and half the insular species of anteaters and opossums.

With our giant binoculars, from our tree-top laboratory outlook, we have recorded eighty birds, or more than a fifth of the Trinidad avifauna. It is good news that, after having been driven away for years, the strange Guacharos or oil-birds have returned to their cave, four miles to the north. (For Miss Hollister's account of this same cave twenty-four years ago, see the Zoological Society's BULLETIN, September, 1926, page 139).

We have forborne intensive collecting, except of common species which we must identify with certainty before studying. This self-restraint is especially difficult in the case of strange and beautiful creatures which come to our tables through the open windows and doors of the laboratory. All such good resolutions disintegrated when we unearthed three Peripatus within a yard of the laboratory. This velvety creature is as near a living missing link as may be, between worms and insects. In evolutionary significance it is to be rated with Balanoglossus, Lungfish, Hoatzins, Platypus and Tree Shrews.

Of our special problems I can give only one example, which must suffice until results have accrued of sufficient importance for publication.

As an instance of the fertilization of flowers dependent on vision: based on the assumption that birds can distinguish red, whereas bees and many other insects are sensitive to ultraviolet but not deep red. For months the mountains around Simla have been scarlet with the concentrated bloom of the *Erythrina* or bois immortel trees. Two methods of approach were made, by way of ultraviolet reflection and the presence of visitors to the flowers. Miss Crane found, by photography, that the blossoms gave off practically no ultraviolet, and only small amounts of the other wave-lengths visible to insect honey-seekers. Independently, I spent considerable time watching the distant trees through twenty-power glasses. I found insects almost absent, while there was an abundance of tanagers, honey-creepers and giant orioles probing, and hence fertilizing the flowers. It is by similarly dissimilar approaches that we intend to check and recheck our findings.

Individual staff work will be reported upon later. At present it is too closely interdigitated with practical affairs. Henry Fleming works on his beloved insects with one hand and half a brain, and with the rest labors with the cussedness of inanimate machinery, and that horrid phrase, 'necessary utilitarian installations.' Miss Schlageter and Douglas Boyden have produced several score of micro-floral and micro-faunal paintings. There is a series of fungi and lichens, enlarged forty to one hundred times, which out-Dalis Dali and is redeemed from surrealistic imagination only by the fact that we have the subject of each painting carefully preserved and labelled, ready for future identification. With minute dragon creatures, equally enlarged, walking about among this nightmare vegetation, we already have an unprecedented exhibit for the next Annual Meeting. Deepsea fish are the only

(Continued on page 99)



Laura Schlageter has the task of recording, in drawings of the minutest detail, the colorful lichens and the weird, convoluted fungi.



CAMERA ANGLES AND ZOO ANIMALS

SINCE THE OPENING of the Zoological Park on November 8, 1899, more than 107,000,000 visitors have viewed its collections of animals from every quarter of the globe. And in the past half century other millions have learned about the wonders of animal life through publication of the Zoological Society's photographs in newspapers, magazines, encyclopedias and text-books.

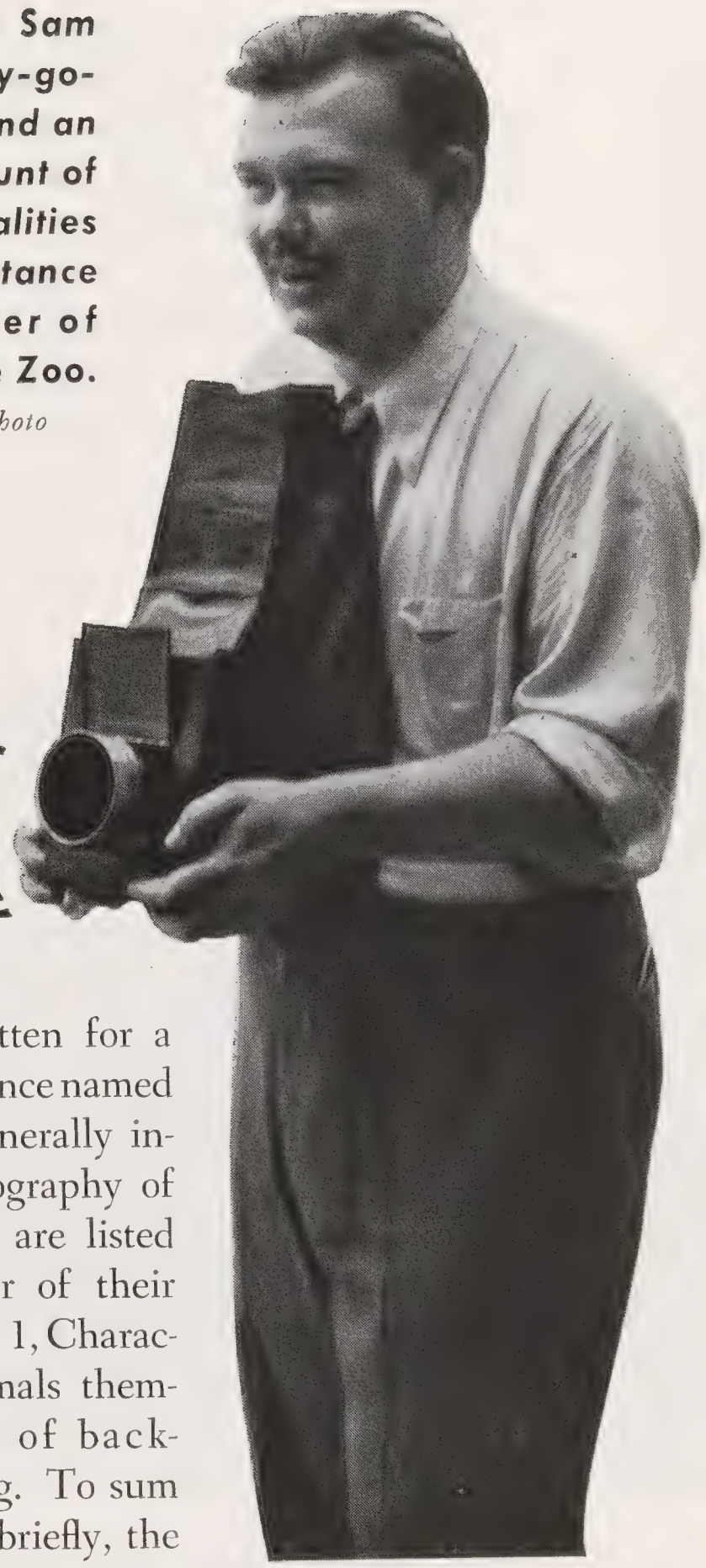
It is impossible even to estimate how many persons have seen, and will see, the Society's color motion pictures, complete with narrations and sound effects. But we may be sure the advance of technology in the production of better visual aids will stimulate rather than diminish the demand for the high type of still photograph available in the Society's collection of 26,000 negatives.

This collection is the result of the work of several photographers, but was formed basically upon the work of one man, Elwin R. Sanborn. He was an artist who worked with lens rather than brush, and the fact that many of his pictures are still in demand as the best available attests his complete mastery of the medium. A successful nature photographer must not only know what makes a good picture, but he must combine the arts, sciences and trades of the artist, chemist and electrician to achieve superb results. Elwin Sanborn knew all phases of his profession, and what success I, his most recent successor, have had in the field of animal photography is due in no small part to the advantage I had in a friendship begun when he was at the peak of his maturity. The principles laid down by Sanborn for producing the best possible animal photograph, be it of mammal, bird or fish, are just as valid today as they were when I first discussed them with him more than twenty years ago.

Today probably one out of three visitors to the Zoological Park carries some kind of camera and uses it frequently. This is a reflection not only of the public's interest in our exhibits and a desire to carry away some tangible record of the visit, but also of the immense interest in photography as a hobby. The production of photographic equipment and materials is one of the high ranking American industries, and of the total amount produced annually more than two-thirds is consumed by amateurs.

Despite the tremendous number of films ex-

posed by amateurs at the New York Zoological Park and other zoos, the net of really good animal pictures is disappointingly small. Many zoos hold photographic contests from time to time and the type of picture most frequently submitted seems to be a Lion or a Tiger staring through



Staff Photographer Sam Dunton has an easy-going temperament and an inexhaustible amount of patience—two qualities of the utmost importance in a photographer of wild animals in the Zoo.

Henry D. Hammond Photo

By SAM DUNTON
Staff Photographer

bars or wire mesh. This is always titled "Caged Lion" or "Caged Tiger"—and is essentially just that! Such a picture is not even an accurate representation of the spirit of most large zoological parks; the Bronx Zoo, especially, is dedicated to the out-of-doors, barless type of enclosure where animals can be shown in an essentially natural setting. Since 1941, when our great African Plains was opened, ample opportunities have been afforded photographers to make pictures of animals that are not only pleasing from an artistic viewpoint, but are truthful as a technical representation of the animal as well. Antelopes romp on our African Plains as unconcernedly as on their native veldt. Rare Père David Deer graze peacefully on a wide expanse of hillside. Sea Lions dive from a high rock outlined by blue sky, into the deep green water of their pool. Brilliantly colored tropical birds preen and posture in glass-fronted, naturally planted enclosures in our Jewel Room exhibit. Why waste film on a few animals that for security or other reasons must still be kept behind the conventional bars or wire? In any case, there is no excuse for the advanced amateur to turn in wire-marred pictures, for every photographic magazine has carried repeated articles on the ways of eliminating wire and bars in the finished print.

In an article written for a technical journal[1] I once named the three factors generally involved in the photography of zoo animals. They are listed again here in order of their relative importance: 1, Characteristics of the animals themselves; 2, Choice of backgrounds; 3, Lighting. To sum up the whole story briefly, the ideal animal picture is one which shows the important features of the animal as plainly as possible, in a setting that complements the main subject. By no stretch of imagination could this setting be an ugly wire fence or a maze of bars. Beware the "worm's eye" view, however. An attempt to outline an animal against the sky, especially when made with a short focus lens, will in many cases elongate the legs of the animal out of all normal proportion.

A story which illustrates the importance that Elwin Sanborn attached to good backgrounds concerns a herd of wild horses exhibited many years ago at the Zoological Park. Director Hornaday had for some time wanted a photograph of these animals, but they were kept in a rather

[1] Certain Problems in Zoo Photography. *Biological Photographic Association Journal,* Vol. XIII, No. 1, Sept., 1944.

small, wire-fenced corral, and he found it difficult to convince the photographer that they would make a "good" picture. The Director, who apparently had never heard of Nelson's blind eye, finally reached the point of issuing a peremptory order. Shortly thereafter Photographer Sanborn arrived at the wild horse corral with truck, platform ladder and numerous assistants. After trying a number of locations at various heights, none of which proved acceptable, he climbed to the very top of the ladder and aimed his camera successively north, south, east and west. Every



These weary Tiger cubs were sound asleep until our photographer waved meat-scented fingers under their noses—then they awakened!

few minutes he would pop out from under his black focusing cloth, mumbling to himself, and would then disappear again. After half an hour's fumbling he threw the focusing cloth to the ground, climbed down shouting "I can't see a thing but Blank Blank apartment houses!" and drove off. Later, when the horses were transferred to a larger corral, he took some of the "good" photographs the director wanted.

Inexhaustible time and patience are necessary to any photographer desirous of getting the ultimate in animal pictures, whether it be in the zoo or in the wild. A creature that has been driven or shooed into camera range always *looks* as if it had been hustled, and definitely does not produce a natural picture. If the photograper can wait until the animal assumes the desired position of its own volition, and against a suitable background, the chances of getting a really good photograph are high.

Some years ago Curator-Aquarist Christopher W. Coates wrote in the New York *Sun* in response to an inquiry about the best kind of camera for photographing fishes: "Almost any good camera can be used to photograph fishes. What is much more important is the skill and patience of the operator. These traits must be accentuated



A lot of ingenuity and patience went into the composition of this picture (other half on the next page) of Benny ignoring the floating ball.

to the nth degree to get really good pictures."

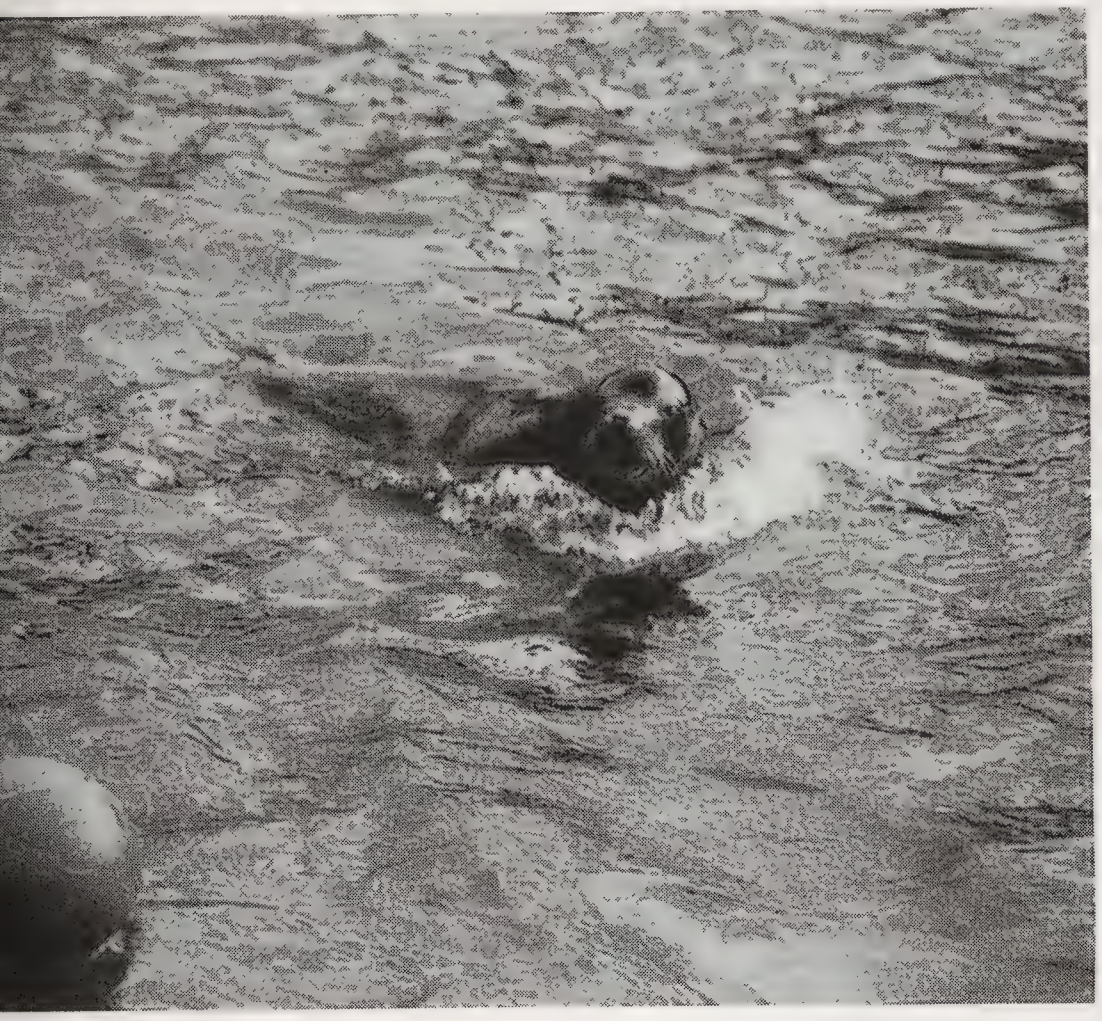
After a good many years of animal photography, I fully agree with Elwin Sanborn that the only way to get good animal pictures is to use as much time and patience as is needed. However, in a zoological park that is changing as rapidly as ours, and where the demands on a staff photographer's time are correspondingly great, it is impossible to spend a great deal of time on individual pictures. This is especially true when it is necessary to make color motion pictures, color stills and black-and-white stills of the same subject practically simultaneously. The problem, then, is to produce a posed picture which will not look posed and *will* be the equivalent of one that

might be obtained by the time-honored method of watching and waiting.

A Zoological Park photograph I have always liked is a scene of our African Plains. Antelopes browse at the edge of a waterhole while three Lions majestically survey their kingdom from a rocky ledge beyond. Fields and foliage in the background help to create an illusion of the real Africa instead of a facsimile in the Bronx. President Osborn had observed this peaceful scene one summer morning, and suggested that I make the picture. Ideally, the way to make such a photograph would be to wait until the animals grouped themselves as Mr. Osborn had seen them; certainly no amount of driving would ever get them to arrange themselves in such unconsciously peaceful attitudes. However, as waiting for such a picture to compose itself might well be a matter of days, it was decided to make an attempt to "set up" the scene.

Proceedings were started with the able assistance of Keepers Dalton and Rolla. A quantity of the antelopes' favorite food was strewn along the edge of the waterhole before the animals were turned out of the shelter house. The next step was to coax the Lions from their accustomed resting place in the shady area next to a stockade to a spot on Lion Rock overlooking the waterhole. This was accomplished neatly enough by Keeper Dalton who dangled a piece of horsemeat in view of the Lions, while standing behind a bush just out of camera range. Sniffing the meat-scented breeze, the Lions approached the edge of the rock and settled down, hoping Dalton would fling their breakfast across the moat. At this moment Keeper Rolla opened a gate and released the antelopes which at once sauntered down to the water's edge and started to feed. For a few seconds they jostled for position and I was just on the point of snapping the shutter when a boisterous Kob chose to run through the herd. That startled them and every antelope went leaping off to the far end of the Plains. This happened several times — persistently, after the antelopes drifted back and resumed feeding, the Kob would race through and scatter them. But the Kob's excess energy finally dissipated and I got the picture I wanted. It took just about an hour and a half to pose a picture that might otherwise have taken days or even weeks.

Animals out-of-doors and in a three-room apartment are entirely different situations, and when I was asked to photograph three baby Tigers in Mrs. Fred Martini's living room I really expected



The floating ball had to be anchored and then Benny finally lost interest in it. Food lured the other Sea Lion into position near the ball.



A peaceful morning scene on the African Plains—but one that took a great deal of arranging before all the animals were in position.



to get a picture with a minimum of effort and time. Surely it should be a simple thing to handle kitten-sized Tigers that had been reared under the loving supervision of the wife of our Lion House Keeper, in her own apartment! The cubs' own mother had refused to nurse them, Mrs. Martini had been making completely spoiled pets of them, and I figured they would do what they were told. I arrived at the Martini apartment, just outside the Zoo, loaded down with camera, tripod, accessory extensions, flashbulbs, reflectors and so on. During the next few hours I learned that baby Tigers are just about the liveliest things on four legs. They raced from one end of the apartment to the other, defying not only the limitations of flash camera equipment, but the laws of gravity itself! What we wanted was a quiet, brothers-and-sister picture of the trio affectionately grouped on a sofa. They did indeed leap to the sofa occasionally but it was only a springboard for a jump to a chair or a scrambling race up the curtains. Mrs. Martini scolded and cajoled but it was impossible to get all three cubs in the same place at the same time. Furthermore, they were either very frisky or very, very tired. And when they were tired they would, like children, drop off instantly to sleep. Finally it got so late that Mrs. Martini had to abandon Tiger-training and start preparations for dinner. Worn out, the cubs were now curled up on the sofa, dozing in one indistinguishable, unphotographable, soft mass of fur. The aroma of simmering meat drifted into the living room and with it came the inspiration for another application of our "special methods for difficult subjects." Quickly slipping a film holder into the camera and placing a flashbulb in the gun, I rescued the meat wrapper from the garbage can, rubbed my fingers over the paper, and dragged them under the cubs' noses. Instantly their eyes popped open, keen and alert, their heads went up, and the picture was made! That was, I am afraid, one situation in which all the time and patience in the world would have been to no avail; a trick was the only thing that could save it. The same technique has since been applied to other baby animals with highly satisfactory results.

lossom the Chimpanzee was in a most non-coop-rative mood and just on the point of giving a Bronx cheer" when this picture was taken. Half n hour later she halted her antics, posed quietly.

Little Benny, our baby Sea Lion, loved to play with any object that dropped into the big Sea Lion pool at the north end of the Zoological Park. We first noticed his playfulness when a visitor's hat blew into the water. Benny (who subsequently had to be renamed "Benita") derived so much fun from this, and from newspapers, popcorn sacks and similar débris in the pool, that the Zoo staff decided he should have a large rubber ball for his special delight. So a gaudy ball was purchased and tossed into the pool – and Benny paid no attention to it at all. His tastes were by now adamantly plebeian; he was interested only in peanut shells, paper bags, popsickle sticks and similar flotsam. The ball he ignored, and it was finally removed. Considerably amused by the incident, one of the staff decided to write a story about it and I was assigned to get a picture of little Benny scorning the ball. This looked like another of those sure-fire, ten-minute jobs, but it soon proved otherwise. In the first place, completely reversing precedent, Benny fell in love with the ball as soon as I appeared with my camera. He pushed it hither and yon, from one end of the pool to the other, while I rushed along the slippery ledge just above the water, dodging adult Sea Lions and projecting fence supports, hoping to be on the spot in case Benny lost interest in the ball for even a few seconds. After 45 minutes I gave up and decided it was another case where "special methods" were necessary. These were simple but effective. The ball was anchored to the bottom of the pool with a long wire and a heavy weight, so that although it would sway slightly it could not be pushed out of camera range. Benny was a bright young Sea Lion and he realized at once that the ball was now a relatively static object. Or perhaps he had had his fun and was just plain tired! At any rate, he climbed out of the pool onto the ledge near the ball. A fish thrown by the skilled pitching arm of Keeper Fred Martini lured an adult Sea Lion into the picture area (for balance in composition), while another flung high aloft caused little Benny to look up and away from the ball, thus fulfilling the assignment for a picture of

Benny paying no attention whatsoever to his beautiful store-toy.

Blossom was a young Chimpanzee we acquired a few years ago, a handsome and healthy specimen that seemed ideal for portraiture. Unfortunately, she was also more than a little skittish and her disposition belied her name, especially under stress. Assistant Head Keeper Reilley was not encouraging.

"She's not too tame," was his dubious comment.

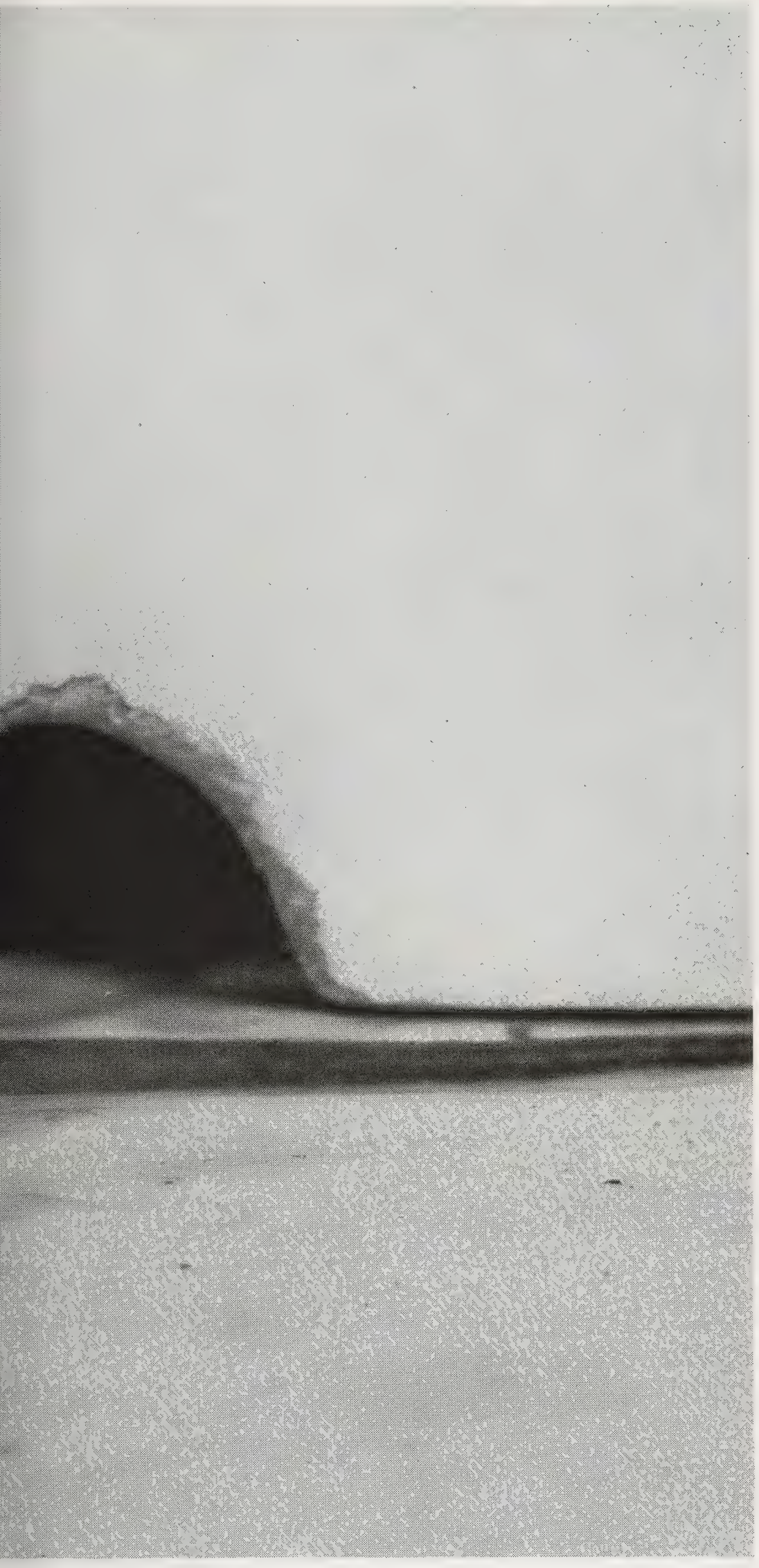
But the portrait had to be made, so I entered Blossom's cage with a flash camera, prepared for a catch-as-catch-can shot. The catch was very bad indeed, for at the instant the flash went off Blossom leaped for the rafters and about all the negative showed was the blur made by a Chimpanzee traveling at high speed for the duration of 1/200th of a second. From the volume of her remarks from on high, I was willing to take Reilley's word that "She won't come down as long as that flash camera's around. She's a little afraid of flash." I was at a complete loss until Reilley, who has had long experience with animals and animal photographers, suggested that if we took her favorite perch – an old butter tub – into the Keeper's room, and set up a couple of floodlights to augment the skylight, he might eventually be able to lead her in after the lights were turned on. His idea was that with all distracting equipment already in place, Blossom would accept the situation and would climb to her perch for a posed



A suspended piece of cheese, a hand-fashioned mousehole and a beam of light—plus a lively specimen of the common mouse — were the elements in this realistic photograph.

picture, there being no sudden flash to alarm her.

The next morning Reilley phoned me that Blossom was in a peaceable mood and that I'd better come right over. I did, and we proceeded as planned. Blossom was led in, she climbed onto the tub – and then she gave forth the most perfect "Bronx cheer" I've ever heard. Her expression was so funny that I took the picture, but it certainly was not a characteristic Chimpanzee portrait. Reilley and I whistled, clapped our hands, did everything we could think of to induce an alert, interested expression, but Blossom, after favoring us with a display of un-chimpanzee-like grimaces, left the tub and began exploring the room. Every time she halted for a moment Reilley would whisper hoarsely "That's it! *That's it!* SHOOT!" I was stalking Blossom with a heavy camera in one hand, a hot flood light on a long extension in the other. From my angle Blossom's momentary poses didn't look like "it," and so the pursuit continued for a weary half-hour until Blossom casually sat down on the floor



directly under the washstand in a corner of the room. The lights wouldn't quite reach but I held my breath and made a very slow exposure. The resulting negative proved to be what some of our staff have termed "The best Chimpanzee portrait ever made!"

But sometimes pictures work out just as you want them to, even though, by rights, they ought to be extremely difficult. I am thinking of a shot of the common House Mouse. Someone wanted a picture of a mouse to illustrate a children's book and it turned out that the Zoo's enormous collection of negatives contained not a single picture of *Mus musculus*. Something more than just a straight mouse picture was desired; the creature had to be posed in "an alert, attentive position, in characteristic surroundings." I had a vision of long hours in the dark waiting for *musculus* to pop out of his hole and take the proper pose. Discarding this thought as impractical – I have to sleep sometime – I hit upon a plan which for once worked to perfection the first time it was tried. A small box was constructed and fitted with wire mesh at the top. One side was painted to resemble the baseboard of a room. Some hasty research enabled me to cut a reasonable facsimile of a mousehole complete with teeth marks around the edge. Mice were not hard to obtain; they infest some of the animal buildings. A mere telephone call produced three fine specimens.

It was a simple matter to choose the fattest mouse, place it in the wire-covered box which in turn was set inside a larger photographic cage in a darkened studio. Camera and flashbulbs were arranged to cover the area around the hole and a piece of cheese was hung above, just out of reach. A bright spotlight was focussed on the interior of the small box and, of course, when it was turned on *Mus musculus* was disturbed by its intensity and crept through the hole into the comforting darkness outside. At that moment it smelled the cheese, sat up on its hind legs and sniffed, and "like a flash" the picture was made.

I have found it true, as Elwin Sanborn told me years ago, that "Animals may be coaxed, persuaded and fooled, but they can't be driven." Anyone who persists in driving them will seldom obtain worthwhile pictures. In a modern zoological park natural pictures abound; this spring, for instance, the New York Zoological Park will open its new Great Apes House. During the warmer months the anthropoids – magnificent pictorial subjects—will disport themselves in large out-of-doors enclosures, with no disfiguring wire or bars. Any amateur with a box camera *ought* to get wonderful pictures, and the staff photographer's job, as far as this group is concerned, should be much simpler. But somehow I have a hunch that the editor of Animal Kingdom will be able to dream up some Gorilla pictures that won't be routine!

PAULA'S BIRTHDAY PARTY

AT THE BRONX ZOO
SATURDAY, APRIL 22, 1950



Blowing out candles and making a wish
quire high concentration in a five-year-

Making a wish wa
where you have onl

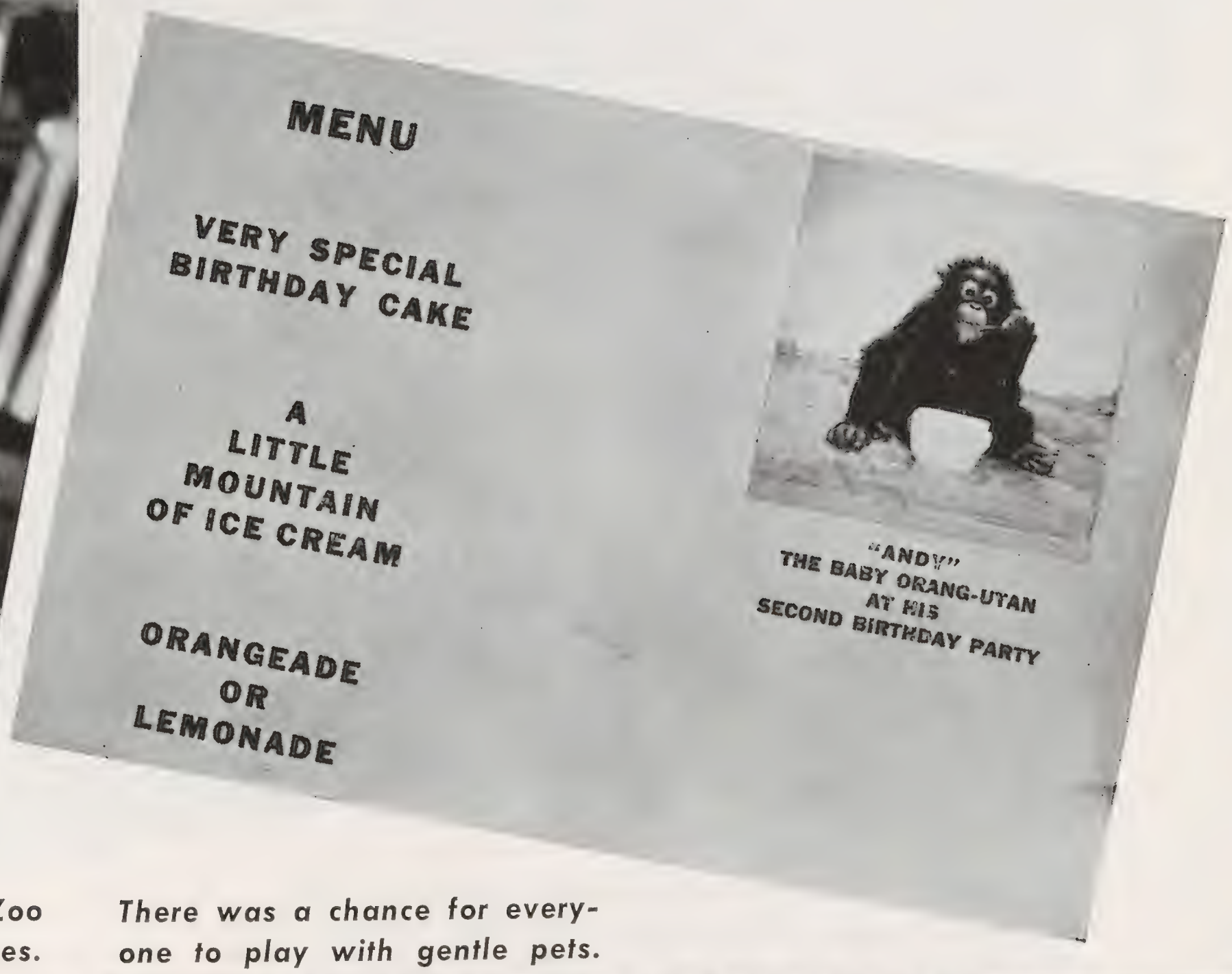
APPARENTLY we have solved the Birthday Party Problem for quite a number of our Members and their friends. There has been a quick and enthusiastic response to the announcement in the last issue of ANIMAL KINGDOM of our tentative plans for arranging birthday parties for children in the Bronx Zoo, and as a result of the flood of requests for definite dates, the service has been started. The first party, pictured on this and the next two pages, was held on April 22 for five-years-old Paula Wolff, the daughter of one of our Members.

As we explained last time, birthday parties under our supervision may be scheduled for any Saturday, either morning or afternoon, between now and next November. There must be ten or more children, 12 years old or younger, in each group. Parties may be arranged simply by telephoning the Zoological Park (FOrdham 7-2000) and asking for "Party Service." All the details can be worked out over the telephone.





e time re-
ula did it.



"ANDY"
THE BABY ORANG-UTAN
AT HIS
SECOND BIRTHDAY PARTY

eal simpler in the Children's Zoo
Wishing Seat and close your eyes.

There was a chance for every-
one to play with gentle pets.







All the children got to ride on ponies and they jogged around the track in a donkey cart or made a rolling, tossing tour on the camel.

The climax of Paula's Birthday Party came at the end of the afternoon when appetites couldn't be held in check any longer—cake and ice cream and gay favors.





Ten years ago the Aquarium collected these eyeless characins in a warm-water cave in Mexico.

FISHES FROM DESERTS AND CAVES

By JAMES W. ATZ

MORE THAN SEVEN-TENTHS of the earth's surface is covered with water, and practically all of this vast area is inhabited by fishes – more than 18,000 species of them. The seven seas, the multitudinous lakes, streams, ponds and swamps all contain their characteristic populations of fish. Some fishes even live on the three-tenths of the earth usually considered dry land. A few make use of temporary pools that periodically dry up, killing all aquatic creatures not able to withstand such un-aquatic conditions. Others make the waters under the earth their home, spending their whole lives in subterranean rivers and lakes. Still others are found in – of all places! – deserts.

These outposts of fishdom are occupied by quite specialized members of the group. Among those inhabiting temporary pools, some are able to hole-up during the dry season, aestivating in the mud until the rains come. Some can travel overland to find water elsewhere. Others die, but leave their drought-resistant eggs behind to carry on the race. Fishes living underground must be suited to the special conditions of life in total darkness, and desert-dwellers must be able to accept high temperatures and concentrations of dissolved chemicals.

Scientists and laymen alike find such fishes of special interest. To the former, at least, they represent tangible evidence of the fundamental biological principle of evolution. Zoologists have made these fishes the objects of classical studies on the evolutionary process; non-specialists have always marveled at their wonderful powers of coping with peculiar and exacting environments. Consequently the recent arrival, within a few days of each other, of a shipment of American desert fish and one of blind fish from an African cave was doubly welcomed by the Aquarium.

The blind fish from Africa came to us via Antwerp, through the efforts of Dr. Walter Van



Newest blind fish acquisition of the Aquarium is a Belgian Congo barb, discovered in 1915. Four specimens now on exhibition are the first seen in America.

Lilo Hess Photo

den bergh, Director of the Royal Zoological Society of that city, who shipped us four specimens by airplane. They are Congo Blind Barbs, *Caecobarbus geertsii,* the first to be seen alive in this country.

Like most barbs they are small, between two and three inches long. Their configuration is barb-like, and they prominently display two pairs of barbels – from which the Genus *Barbus* gets its name. One pair originates from the corners of the mouth while the other is located above and in front of these, just over the upper lip. The most striking physical characteristic of the fish is their coloration, which is white suffused with delicate pink. Actually the fish are totally or almost completely devoid of any pigmentation, the pink color resulting from red blood being seen through somewhat transparent tissues. The gills are very noticeable as two deep red blotches on either side of the head. The eyes are entirely lacking. There is said to be a slight depression at the site of the eye – were an eye present – but even this cannot be seen in the living, free-swimming fish.

Blind Barbs are constantly on the move. At no time have any of our fish been observed to remain still for more than a second or two. Round and round, back and forth, up and down they swim, now fast, now slow, seeming to perform endless permutations and combinations of patterns of motion as they pursue their irregular courses about the tank. Whether they use their barbels, or the numerous tiny pores that have been noted about the head, to avoid collisions with one another, only experiment can tell. In any event, they can travel remarkably fast without seemingly ever striking one another.

The Blind Barb is supposed to have been discovered in 1915 by a M. Delporte.[1] It was not formally described, however, until 1921 by the famous herpetologist and ichthyologist, George Albert Boulenger. He named it after one M. G. Geerts who apparently gave him the four specimens upon which he based his scientific description.[2]

The fish has been found in only one locality, a limestone cave a few kilometers outside of the town of Thysville in the Bas Congo section of the Belgian Congo. This is not a particularly large cave, reportedly about 1,800 feet long. During the dry season the fish are confined to pools well inside, but there is evidence that during the rainy season water from the outside pours into the cave through its mouth, which is located in a valley at the foot of a hill. With such a limited habitat, the total population of *Caecobarbus* cannot be very large. The government has undoubt-

[1] La Barre, *The Aquarium,* 18 (5) : 106-107, 1949.
[2] Boulenger, *Rev. Zool. Africaine,* 9 (3) : 252-253, 1921.

edly recognized this, for it has placed the fish in *Catégorie 1* of the protected animals of the Congo, which means that no one is allowed to collect specimens without a scientific permit.

The parallelisms between *Caecobarbus* and *Anoptichthys jordani,* the Blind Cave Characin studied on the Aquarium's Mexican expedition in 1940, are too numerous and striking to be overlooked. Although the two fishes belong to different Families, they are remarkably similar in many ways. Both are blind and more or less pigmentless, yet both can detect the presence of light and both develop a slight pigmentation after prolonged exposure to light. Casual observation reveals that *Caecobarbus* is light-sensitive; a bright light shone on their tank almost immediately starts them swimming faster than usual, and when the light is turned off the fish soon slow down again. Microscopic examination of the eye region of *Caecobarbus* has revealed that its eyes have become reduced to minute, barely visible, brownish granules, buried in fat, but that all the elements of a normal eye are present, though degenerate, with the exception of a lens.[3] The remnants of an optic nerve are also present. It would be most surprising if this were not the means by which *Caecobarbus* detects light, since the very similar degenerate eyes of *Anoptichthys jordani* have been proved to serve that function.[4] Like *Anoptichthys,* the Congo Blind Barb lives well in aquaria. Both species will eat almost anything and both are reported to live in nature largely or wholly on the droppings of cave bats. This adaptability to captivity has proved most fortunate for zoologists.

The first blind cave fish that was found to live

[3] Gérard, *Mém. Mus. Roy. Hist. Nat. Belgique,* 2 Sér. (3) : 549-552, 1936.
[4] Breder & Gresser, *Zoologica,* 26 (4) : 289-296, 1941.



This is the interior of the Thysville cave in the Belgian Congo, showing one of the pools that form the habitat of the Blind Barb, and some of the fish can be seen, faintly, in the water at the bottom of the picture. This photograph was made by M. J. Heuts, of Louvain, and is reproduced through the courtesy of the Institut pour la Recherche Scientifique en Afrique Centrale (IRSAC).

and breed readily in small aquaria of the type kept at home was the Mexican Blind Characin. For this reason it was the first species with which extensive laboratory experiments could be performed. In 1939 Dr. Charles M. Breder, Jr., then Director of the New York Aquarium, initiated a scientific study of Mexican blind fish – a study in which he is still actively engaged. In 1940 he led the New York Aquarium's Cave Expedition to San Luis Potosi which discovered, among other things, that Blind Characins were interbreeding with the eyed, normally-colored characins which had been presumed to be the ancestral form, that is, the species that had given rise to the blind fish sometime in the past. From this unique observation and others arose a whole series of expeditions and experiments that have tremendously widened our understanding of the origin and evolution of cave life. It is safe to say that no other cave animal has been so successfully investigated. There seems to be no reason why the Congo Blind Barb could not be studied just as profitably; we were therefore very happy to learn that Dr. M. J. Heuts, a Belgian scientist already well known for his evolutionary analyses of the Threespine Stickleback, has been studying the Congo Blind Barb in the Bas Congo. The blind cave fishes of the world – there are nearly 30 of them – have only begun to give up their fascinating secrets.

Another group of fishes that is providing scientists with provocative and useful data is composed of those found in American deserts. A desert fish sounds like a paradox, but deserts are not the completely arid places they are popularly supposed to be. Pools, creeks and springs are all found there, and many are inhabited by fishes. Even Death Valley has two species of fishes!

These bodies of water are generally quite small and often far distant from one another. Many of them represent the remnants of what were once great inland lakes and seas. It has been found that the various species living in these residual waters can be correlated with the geological history of the area. Bodies of water now containing similar or identical species of fishes presumably were contiguous at one time in the past, and investigation of geological formations has often confirmed this supposition.

There are a number of other features of desert ichthyology that hold interest for the student of evolution. One of them is the ability of certain fishes to withstand the high temperatures of hot springs and other heated waters.

The Desert Minnow, *Cyprinodon macularius*, recently received at the Aquarium, is such a fish. Some waters in which it lives attain temperatures of more than 100° Fahrenheit, and experiments have shown that it can live comfortably at 102° – the temperature of a warm bath.[5] Most fishes, including tropical ones, die at temperatures considerably lower than this. Surprisingly enough, the Desert Minnow can also tolerate quite low temperatures, close to freezing in some circumstances.[6]

Nevertheless, Mr. William H. Hildemann, who sent the Aquarium its Desert Minnows, took no chances of having his fish chilled on their airplane trip from California to New York and so he shipped them in a one-quart thermos bottle. Mr. Hildemann, a graduate student in zoology at the Allan Hancock Foundation of the University of Southern California, has collected a number of different species of desert fishes in recent years and has maintained them in captivity. The Aquarium's fish were taken in San Felipe Creek, one of the tributaries of the Salton Sea in southern California. The temperature of this creek is moderate, and so presented no problem of adjustment, but it does contain salt enough to be detected by taste. Desert Minnows, however, seem as tolerant of chemical changes in their environment as they are of thermal ones, so that this, too presented no real problem. If changed over gradually, they will live in either fresh or salt water.

As might be expected with so hardy a creature, the Desert Minnow has a rather extensive range, being found in the lower Colorado and Gila Rivers and their tributaries and the Salton Sea, from southern Arizona to southeastern California and as far south as Lower California and the state of Sonora in Mexico. In appearance it resembles the locally abundant Variegated or Sheepshead Minnow, to which it is related.

Much work remains to be done in explaining the remarkable tolerance of fishes like the Desert Minnow to changes in their environment that would be fatal to most other fishes. Aquarists could well wish that all fishes were so adaptable.

[5] Miller, *Aquarium Jour.*, 20 (11) : 286-288, 1949.
[6] Miller, *Ibid.*, 15 (10) : 96-97, 1942.

An Announcement to Our Members

In the July-August issue of Animal Kingdom for 1949 your editors were happy to announce several coming events for Society members and their friends. Last summer after years of waiting we were able to start three new building projects at the Park.

This June on Members' Day the first of these projects will be opened with a preview for Society members. The new Penguin House, first important new construction unit since long before the war, will be all we promised for it – an utterly delightful exhibit of these beguiling birds clustered along the edge of what appears to be a real Antarctic ice-floe, or swimming at their incredible speed through the cool depths of their tank in the foreground.

Later in the summer or early next fall the second great building will be completed – the Great Apes House. Here our gorillas, orang-utans, chimpanzees and gibbons will be ready for a preview under incomparably better exhibition conditions than the present ones. The animals will occupy roomy, modern quarters indoors in the wintertime and on fair days will be found outdoors in large moated enclosures. This building is the first of its type constructed for the most modern exhibition of the anthropoid apes.

The Conservation Exhibit in the northeast corner of the Park is coming along fast, but it will not be possible to open it in 1950.

These fine additions to the New York Zoological Park fulfill years of planning and have been made possible not only by the cooperation of the City and the State of New York but through the generosity of past friends of the Society – for the Society has made a modest contribution to this new building program.

In the same issue of Animal Kingdom last year, in fact on a page facing the announcement of our new construction plans, we published an article under the title, "This '59-cent Dollar' – How it Works With Us." We foresaw then what has proved since to be true: that under the terms of mounting costs we would not much longer be able to render our services to members as we have done in the past and still expect membership dues to contribute anything at all towards the support of your Society's work.

This was no random opinion. After watching the situation carefully for many months we inaugurated our Contributing Membership class early in 1949 in the hope that enough members would transfer to this new classification to take care of our service cost increases. The response was highly gratifying but not sufficient in increased income to solve the problem.

At a special meeting of your Board of Trustees in April it was therefore voted to increase annual membership fees from $10 to $15 a year and life membership from $200 to $300 – contributing memberships to stand at $25.

To us there seemed to be the best of reasons for this move. We have every cause to believe that our members appreciate the quality and the range of services that we attempt to render them. Every year they increase their attendance at the annual members' meetings at the Waldorf. More members and their families and guests came to the Garden Party last year than ever before. But it has cost us more and more to hold these meetings, to print this magazine, to do all the other things we want to do for you. In turn we feel sure that you want some part of your membership dues to go towards the support of the Society's programs in research, education and conservation.

We feel sure that in our case, as in the cases of our sister institutions that have found it necessary to adopt the same policy, you will wish to continue your support of and interest in the magnificent plans we have for your Society's future progress and social value.



GOANNAS

Giant Lizards of the Australian Bush

By DAVID FLEAY

THE FAMILIAR NAMES of many Australian animals are taken, naturally enough, from the terms applied to them a long, long time ago by the aborigines. One creature, however, has the distinction of being named by Americans: the Goanna (or Goana, as it is sometimes spelled).

This monitor lizard of the genus *Varanus* was a plentiful and obvious feature of the continent's fauna when American prospectors came to us in the gold rush era of the Eighteen-fifties. Some of the prospectors must have been familiar with the various iguanas of the American tropics, for they applied that name to the Australian lizards. In the course of time, and inevitably, "iguana" was corrupted to "goanna," and today it is firmly intrenched in Australian speech.

Probably the best known – at least, the most spectacular – of the monitors is the "Komodo Dragon Lizard" of the Dutch East Indies which the New York Zoological Park was the first, I believe, to exhibit alive. The Australian Goannas belong to the same genus as the Komodo Dragon and one of them, our Perentie (*Varanus giganteus*) of central and northern Australia is said to rival the Dragon in its length of ten feet. Other Goannas are mere pigmies about 18 inches long. All are carnivorous and it takes a considerable

Photographs by the Author

amount of meat to keep the larger ones going, as will appear a little later on in this article.

In the comparatively settled areas of southern Australia there are two quite well-known and widely-spread species. These are the Tree-climbing Goanna (*Varanus varius*) and the Sand Goanna (*Varanus gouldii*). The latter is a ground-dwelling creature, seldom more than four feet long, and an inhabitant of dry, rather parched areas. Typically one thinks of it as scuttling into hollow logs or popping down a rabbit hole when disturbed.

The Tree-climbing Goanna is more exciting. Six to seven feet long, it is impressively large and it has a well-deserved reputation of being one of the toughest characters of bushland. I have encountered this reptile innumerable times and I always think of it as rattling up the trunk of a gum tree by the roadside on a sizzling hot day, or racing across a paddock with an "over arm" motion of its legs, flicking its forked tongue constantly, turning like a flash and dashing away.

There are two well-defined races of this tree-climbing fellow. One is usually yellowish-green

he Tree-climbing Goanna of southern Australia is ne of the larger lizards and often attains impres-ive lengths of six or seven feet. It has "a well-de-erved reputation as a tough bushland character."

with varying crossbands; it is native to the savannah country of northern Victoria, inland New South Wales and Queensland. The other, practically black at maturity and growing to a greater size, ranges from the Healesville-Warburton country through Gippsland to Mallacoota, Victoria — in other words, south of the dividing range and throughout the big timber of the cooler rain forests.

As its name implies, the Tree Goanna finds its refuge aloft and uses a deep, snug hollow as a "bedroom" from which it can crawl and cling to the side of the tree to absorb the sunshine even on spring and late autumn days when it is not warm enough to go hunting.

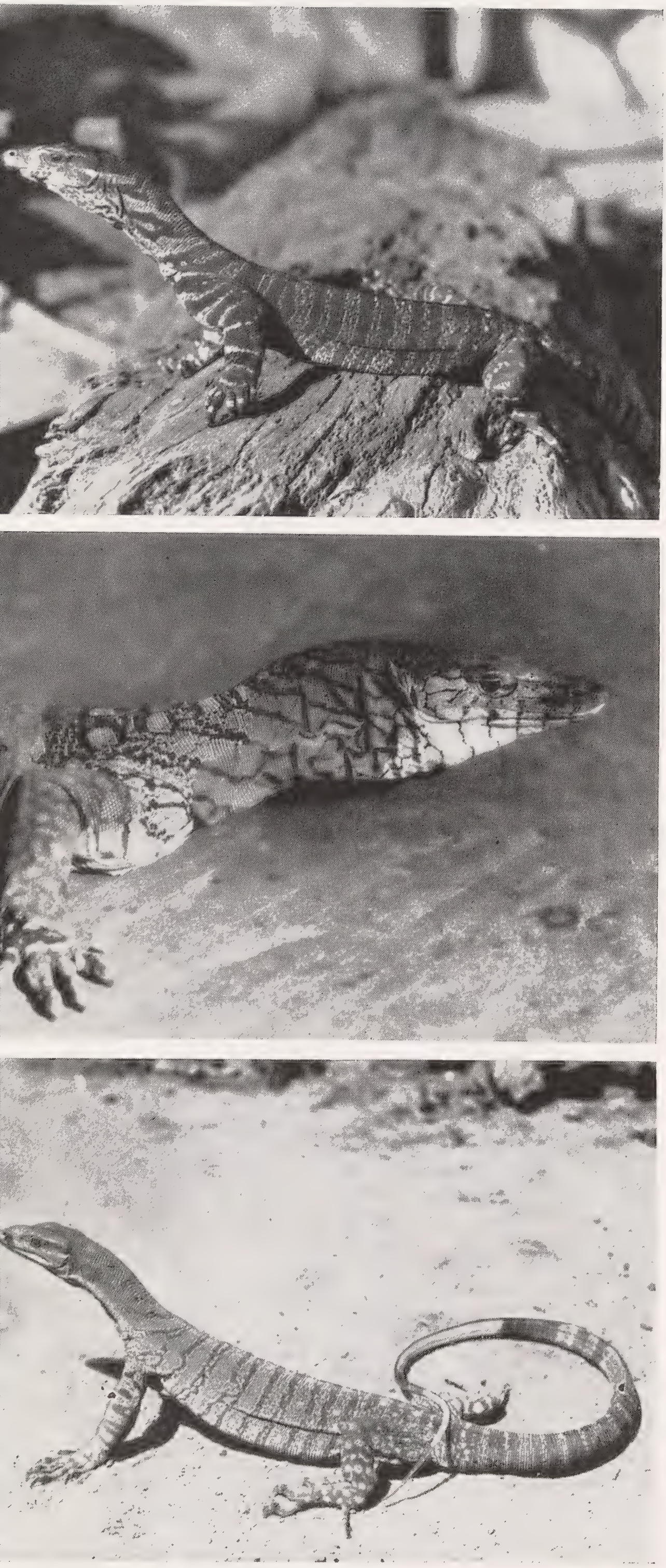
In 1939 it was from such a home tree on Mt. Toolebewong, Healesville, that we captured "Garry," a 35-pound, six-foot Goanna. Set up in a lizard run with plenty of room, trees to climb and a pool to wallow in, this black patriarch of the Gippsland clan wasted no time in vain regrets, and waxed even more portly on rabbit meat and on heaps of eggs — some fresh, but many "faded." In fact it was no uncommon sight for visitors to see him devouring up to nine eggs in succession, and without breaking one — each egg clinking down on top of its fast-receding forerunner.

I shall not soon forget the look of absolute astonishment on Garry's visage one day when an unusually ripe egg went off with a loud explosion just as he took it into his mouth. He seemed more disgusted and annoyed with the behavior of the egg than with the resulting cloud of H_2S.

Just before the tragic bush fires of the summer of 1939 Garry lost the limelight at Healesville, for from the Maroondah Lake watershed on Mt. Monda came a veritable grandfather of all Goannas. For many months tales of this immense creature, seen occasionally by patrol men of the Melbourne and Metropolitan Board of Works, had reached us, but trips in search of him had proved in vain.

One hot day at this period, the late Arthur Hort, one of the greatest bushmen Healesville has ever known, met the giant lizard as it was about to ascend a large tree on Mt. Monda. Its belly bulged; it was obviously full of food. By means of a careful piece of stalking and a smart dash, Mr. Hort managed to seize the end of the scaly tail. Then began a battle royal with the huge six-and-a-half-foot Goanna — 45 lbs. in weight and crocodile-like in thickness of its legs and body — struggling violently and uttering bellowing hisses like a steam engine. It blew out its throat pouch, thrashed its powerful tail, hooked its great claws into roots and logs and swung wide, menacing jaws with their rows of hooked teeth, at its captor, but he hung on with determination.

Eventually after a pretty grim and exhausting few hours, the perspiring captor got down to a Healesville hotel where, prompted by his irrepressible sense of humor, he "wheel-barrowed" his prize into the bar. Mr. Hort anchored the captive with a plough chain about its neck and a 40-pound weight tied to its tail, and summoned me to come and get it. When I arrived, I found not only the Goanna but also the disgorged remnants of its recent meal — four fox cubs, three young



rabbits and three large blue-tongued lizards! That inventory gives some idea of a Goanna's meat-eating abilities.

The female Tree Goanna usually lays her eggs just on mid-summer (December to early January) and buries them in the humus of an old

The handsome pattern of yellow and green markings on the black body background of the Tree-climbing Goanna shows up strongly here.

stump or in an abandoned termite mound. Those that I have handled varied from six to nine in number and were comparable in size to hen eggs, though much more narrow and covered with a leathery, parchment-like, flexible "shell." One summer a female Goanna failed to bury her eggs so we performed this operation for her, providing a close meshed wire cover to trap the emerging youngsters and so to check on the incubation period. The first little fellow appeared after a lapse of six weeks and immediately began blowing out his throat pouch, hissing and lashing a small but very smart tail. Such youngsters are

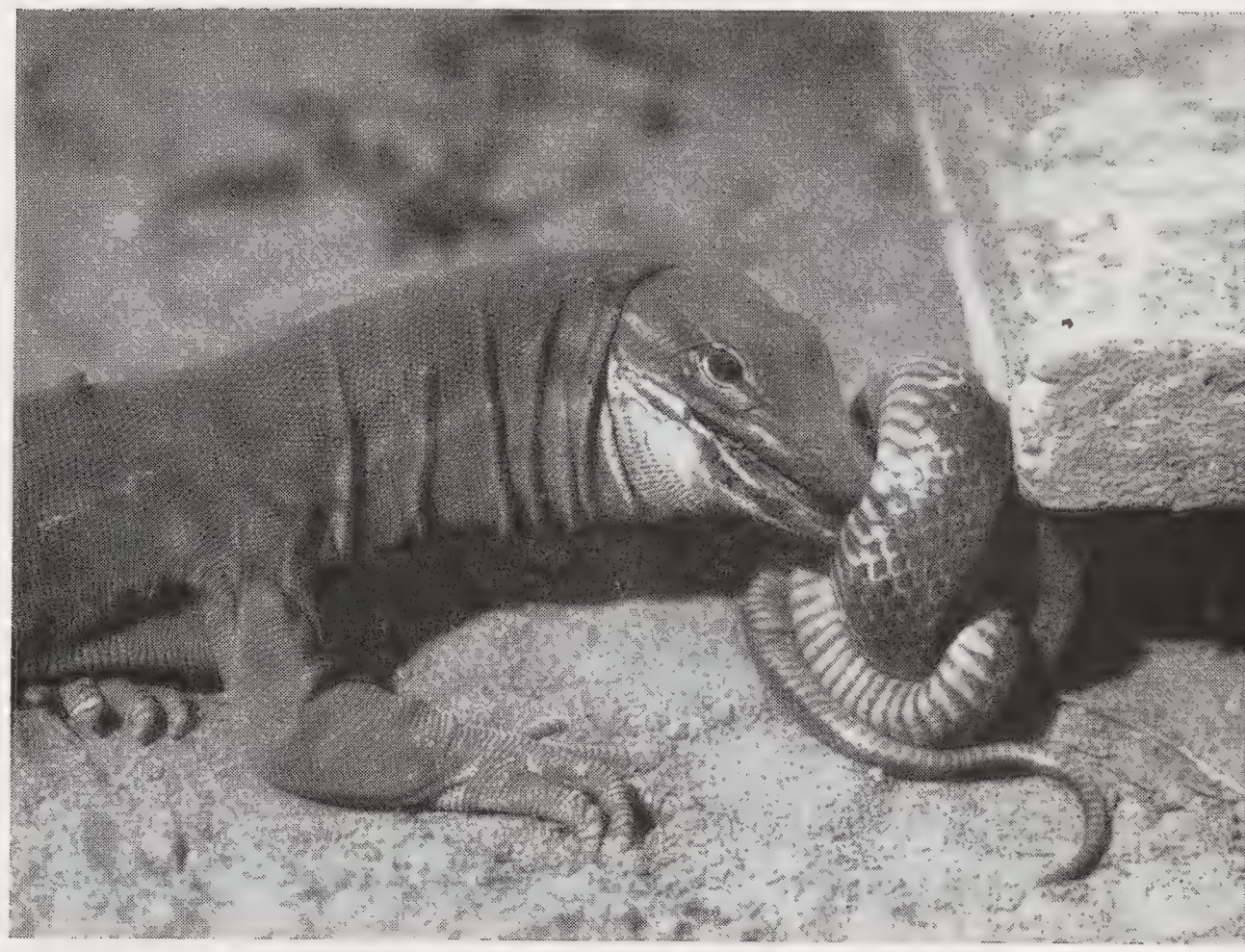
Australia's largest lizard is the Perentie of central and northern Australia, said to rival the Komodo "dragon" with a length of 10 feet.

brightly marked from the time of leaving the egg and for the first two years they are a joy to behold. Handsome patterns of black, yellow and green paint the clean beady "chain armor" while broad muzzle and tail bands are boldly revealed. The young fellows are incredibly active and lightning fast, scurrying for short distances over the ground and up trees which they climb on the corkscrew system, at unbelievable speed. Indeed, they need to be very spry at a tender age, for the Kookaburra, the Raven, the Butcher Bird, the Currawong (*Strepera*) and snakes are natural enemies. As the monitors grow older — and like

The northern Tree-climbing Goanna demonstrates how the tail is curled preparatory to a lashing blow. This is often an effective defense.

most large reptiles they are very long lived — the coloring becomes duller and darker; and real "old men" of the Gippsland or southern Victorian type are, with the exception of lighter tail bands, as nearly black as can be.

Perhaps the most persistent Australian bush yarn associated with Goannas concerns the belief that their bites break out annually as open sores. This, however, can be relegated to the same dust-bin as the folklore of snakes swallowing their young, blue-tongued lizards sucking



Gould's Monitor Lizard, or "Sand Goanna," had some difficulty in subduing and eventually swallowing a Tiger Snake about 4 feet long.

cows and kangaroos being born in the pouch.

At least four Goannas have "tasted" me — one iron-jawed bite having left a permanent scar now twenty-two years old. This memento, delivered by a tough old warrior who once came in contact with and survived the effects of high tension wires, took the form of the tearing off of the back of my right hand. Though this painful wound took three months to heal, like the others it gave no further trouble. But the most unpleasant feature about a Goanna bite is the fact that the lizard hangs on with fanatical determination and usually cannot be persuaded to release its grip unless

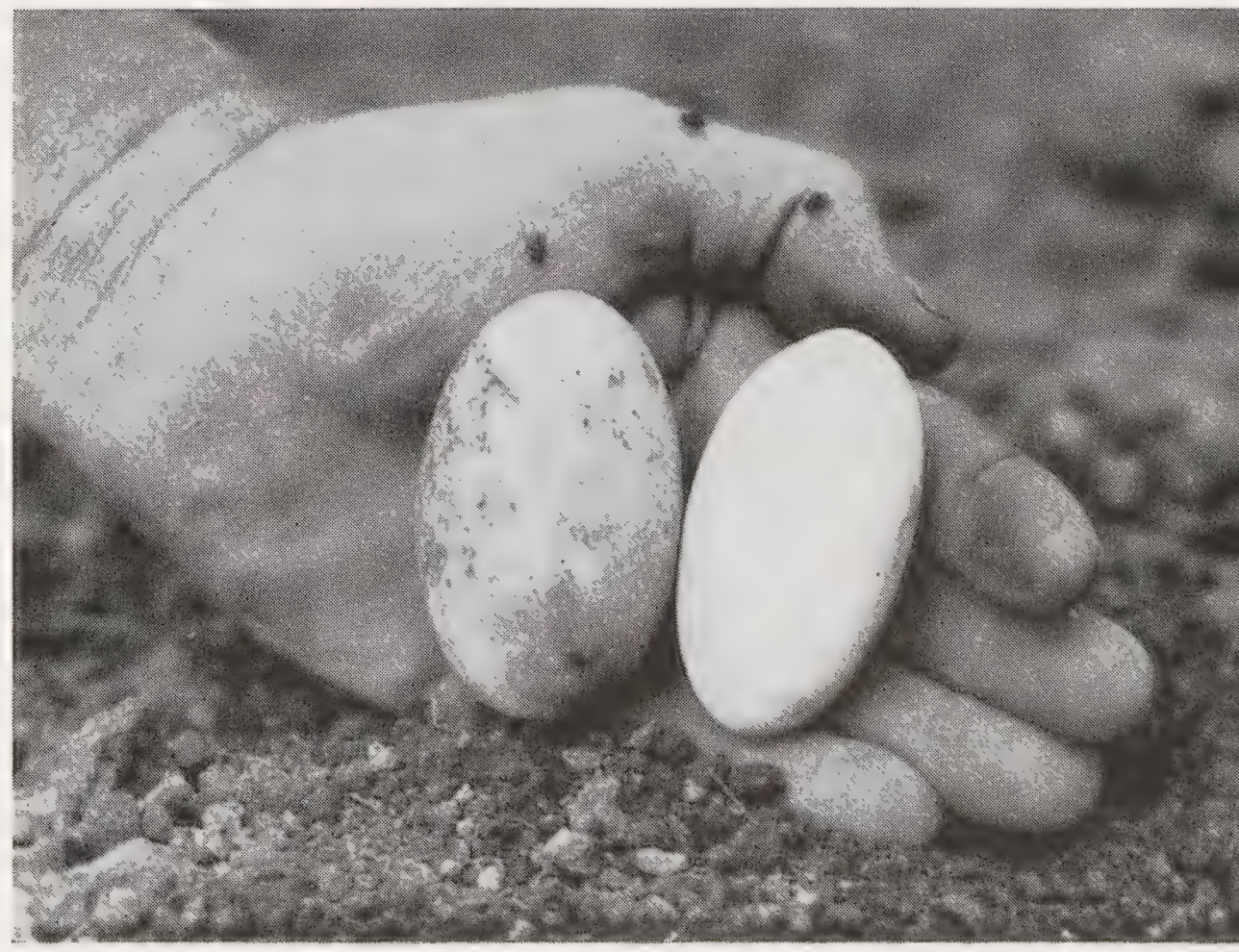


The Sand Goanna has nearly subdued its Tiger Snake enemy at this stage. Marks of the long conflict are clearly visible in the sandy soil.

its tail is twisted clock-wise or counter-clock-wise with equal enthusiasm.

Such accidents were usually sustained in the course of capture when — building on the fact that the lizards cannot count — I would remain "frozen" at the foot of a Goanna tree while a companion walked away, resulting usually, after the lapse of 15 to 30 minutes, in the long lean fellow crawling down head first to within reach of a swiftly clutching hand.

Another bush belief, this time with the backing of veracity, warns tenderfeet against standing about in the open when a dog chases Goannas,



These are fresh-laid eggs of the Tree Goanna. They have a tough, leathery but flexible shell and 6 to 9 are usually deposited in a clutch.

for the lizard in its headlong excitement is liable to run up one with devastating effects from its heavy curved claws! The climbing instinct is decidedly uppermost in the species with which we have been dealing and I know from personal

experience that in the absence of handy trees such a fugitive may rush heedlessly up a man or horse in its attempt to reach the usual lofty and therefore "secure" environment. On the ground, at bay, with no chance of ready escape, the big lizards wield their tails from side to side in slashing sweeps carrying the drive and sting of a stock whip. Dog victims of such strokes beat rapid retreat with terror-stricken yelps.

One of the Goanna's greatest accomplishments is that of destroying and eating snakes, and there is no doubt that young snakes are quite often an item on the menu.

"Banjo" Paterson, an Australian poet, immortalized the subject in "Johnson's Antidote" in which a valiant old Goanna, having swallowed his Tiger Snake opponent whole, is pictured as feeding upon a certain bush that supposedly cures the ill effects of the venom collected in battle. Johnson, in great exultation, takes his grand elixir home, finding out later that "Half a tumbler killed an emu and half a spoonful killed a goat."

Actually the truth of the Goanna's apparent immunity from snake venom lies in the extreme toughness of its close-knit "chain armor," its scaly coat, and in the much higher degree of resistance of its system to amounts of venom that would readily kill mammals and birds.

"Banjo's" vivid portrayal of reptilian battle where "In and out they rolled and wriggled, bit each other heart and soul," is remarkably true to life, and it came to mind unbidden on a fortunate occasion, on a hot summer morning, when I watched and photographed a fight to the death between a four-foot Sand Goanna and a Tiger Snake of equal length.

The Goanna sparred with the lunging "Tiger" until it was able to rush in and clamp its jaws firmly across the snake's head. Then with enormous enthusiasm it endeavored again and again to grind this vital portion of its deadly adversary into the ground. The snake countered by twisting the rest of its body into a tight knot, thus hampering the Goanna considerably, but at the end of half an hour the snake was so weakened that the Goanna planted the claws of its forefeet on the coils and tugged strenuously. Gradually, inch by inch, it gulped the snake down until only a feebly protesting final few inches of the victim remained. The "Tiger" must have been the cause of some internal upheaval, however, for suddenly the lizard disgorged its still-living victim with considerable violence. Walking away a few paces, it wiped its jaws vigorously on the ground, and then scampered off with never a backward glance.

Some twenty minutes later it returned to the crippled snake. Again seizing it by the head, it repeated its damaging tactics of the initial attack. Then ensued another half-hour's strenuous gulping and the snake was swallowed completely —The Goanna had to indulge in fantastic contortions and painful neck bendings to compress the elongated body of its victim, but eventually, tightly distended, it shuffled away to rest and digest.

IN SPITE of their obvious claims to consideration, Goannas are seldom treated as generally useful and distinctive members of Australia's wild life.

Sad to say, these destroyers of rabbits, rats, mice and snakes and disposers of carrion are all too often wantonly shot, even on back roads, miles from habitation. Quite recently I found a big black Goanna dead on the fence line of Coranderrk — an extension of the Healesville Sanctuary. A rarity in this area, the unfortunate lizard had been needlessly destroyed on the very boundary of a Sanctuary for native fauna in general.

It is known and admitted that Goannas exhibit a fondness for the eggs of wild birds aloft in the gum trees and also for those found in farm chicken runs. Individuals showing an incurable penchant for farm produce certainly must be dealt with, but with the very marked diminution of the big lizards over the past fifteen to twenty years it is time we in Australia considered measures for some form of protection — not only for these rattling, lively old fellows that lend such a degree of interest to country roads, but to the generally persecuted, harmless and useful lizards in general. Fortunately, in Victoria, at least, Mr. Dunbavin Butcher, Director of the Fisheries and Game Department, is even now considering measures for the future safety of the four-legged reptilian population.

News from the Conservation Foundation

Ground Water Survey Will Be Completed in June

SPRING FINDS THE STAFF of the Conservation Foundation busy on a multitude of fronts. In anticipation of the completion of the Ground Water Survey early in June we are seeking the best means to bring its results forcefully to the attention of the many people for whom they should be useful. There is, of course, material in this survey of primary concern to engineers and others directly interested in water management problems. There are materials for technical books and periodicals as well as much information that should find its way into popular publication, generally in mass circulation magazines and regionally or locally in newspaper articles. We hope to find the most direct avenues to broad distribution in order to establish a publication policy that will be applicable to other projects as they reach completion.

In continuation of the Ground Water Survey, the staff has been working with representatives of the National Association of Manufacturers to conduct a joint survey of industrial water uses among the 14,000 members of that organization. By means of carefully prepared questionnaires circulated among this large group of manufacturers it is expected that trends in water use practices can be established by industry and by region —an extremely valuable contribution to knowledge of the nation's water needs. This N.A.M. survey has the added value of bringing the Foundation's work directly to the attention of the larger part of the country's industrial leaders.

The Soil Erosion Survey is being expedited, according to Mr. Osborn and Mr. Snider who met with Sir Herbert Broadley, Director of the Food and Agriculture Organization of the United Nations, for this purpose early in April. The first part of this survey covering the United States, Canada and Mexico is expected to be ready for publication in 1950. The second part, relating to erosion conditions in the rest of the western hemisphere, will be completed in 1951.

Mr. Ordway and Mr. Smith met with Dean Mason of the Littauer School of Public Administration at Harvard on April 18 for the purpose of furthering plans for the Economic Seminar in Agriculture, Forests, Water and Land Use Policy which it is hoped will be conducted next fall in Cambridge. Basic funds for the financing of this seminar have been found but additional contributions are needed to provide for several important fellowships which would add materially to the value of the course.

On May 2 and 3 Mr. Osborn visited the University of Michigan with Mr. Randolph Pack to take part in the inauguration of the new Chair of Conservation which is being established at this great university. This chair will be held by Dr. Stanley A. Cain, formerly of the Cranbrook Institute of Detroit. It is most gratifying that Michigan and Yale are embarking this year on major conservation training programs stressing ecology, human populations and resource subject matter.

In the field of publication the Foundation staff is happy to announce the completion of the Public Affairs Committee's first illustrated pamphlet, in the production of which several members of the staff collaborated. This attractive popular document is expected to have a wide distribution and should be of material help in increasing public awareness of conservation needs.

Mr. Ordway's Memorandum on Approaches to Government Organization for the Development of Natural Resources has been printed and will be available to individuals interested in governmental aspects of the conservation issue on federal, state or local levels. The *Conservation Handbook* by Mr. Ordway, published last August, has sold more than six thousand copies, and has been nominated for the annual award of the National Association of Conservation Education and Publicity for the book contributing the most to conservation education in the United States.

In passing, Society members interested in re-

ceiving the first annual report of the Conservation Foundation may receive this document by writing to the Foundation's office at 30 East 40th Street, New York 16.

Mr. Brewer and Mr. Gibbs have been busily engaged in the production of the Foundation's third film series, *The Web of Life*. The first reel of this ecological motion picture is completed and the second will be finished by the time this magazine reaches you. We have also been requested to assist and advise in the production of a film on animal husbandry and range use to be sponsored by the American National Livestock Association. While this film may not represent the views of the Foundation on this vital subject, the staff feel that it is our function to give objective technical advice when it is requested from such important sources.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

Charles Cordier Captures Eastern Umbrella Bird

Latest word from Ecuador is that Charles Cordier, our animal collector, has captured at least one specimen of the eastern form of the Umbrella Bird, *Cephalopterus ornatus ornatus*. Charles is far down the eastern slope of the Andes, in difficult and dangerous territory (dangerous because of the uncertain transportation and possibly unfriendly Indians) and the only message he has been able to send down river was a brief cable, apparently carried out to a telegraph station by a native. The message referred to his difficulties in getting air transportation for his collection because of the flooded runway of the airfields, and so we do not know exactly what birds and mammals Charles has collected on the eastern slope, or exactly when he will be able to finish his general collection, out of his base camp at Quito, and return to New York. Tentatively his return is set for about July 1.

It's Baby Time Again

Late winter and early spring have produced an interesting crop of wild animal babies in the Zoo. To date we have four Raccoons, three Aoudads, two Mouflon, two Blackbuck, one Patagonian Cavy and four Muntjac.

In the normal course of things we can expect quite a number of deer fawns early in June.

Lion Island Understudies

Visitors to the Zoological Park will notice a sudden increase in the Lion population, with six awkward and playful, year-old cubs on exhibition in the central out-of-doors bay of the Lion House.

They are not, actually, new acquisitions, having been received last year as eventual replacements for the three older males now occupying Lion Island in the African Plains exhibit. The cubs have been spending the winter in the Lion Shelter House on the Plains. They will pass one more winter in seclusion there, and in the spring of 1951 they will take up residence on the island. At that time the three original inhabitants, now about ten years old, will be disposed of to other zoological parks.

Farm Not Open Yet

Our Farm-in-the-Zoo, which normally opens its gates in mid-April, is still closed and its opening date is indefinite because of construction connected with the Bronx River Parkway Extension which cuts across a corner of the Farm.

Unseasonably cold and rainy spring weather has retarded by about two weeks the spring release of many birds and mammals from winter quarters. By late May, however, the Duck-billed Platypuses, storks, monkeys and gibbons could be put out of doors in their summer quarters, and zebras were released on the African Plains annex.

"Jamboree Troop No. 7" of Boy Scouts in the Bronx will reproduce a Bronx Zoo atmosphere at a nation-wide encampment of Scouts at Valley Forge from June 30 through July 7. The gateway to Troop 7's camping place will be formed of large cutouts of a Gorilla, Elephant, Tiger, Giant Panda and King Penguin lent by the Zoological Park.

Children's Zoo Sets a Record

The Children's Zoo opened for its tenth season on Saturday, April 8, and eight days later, on Sunday, April 16, it set an all-time record for attendance—7,439 visitors. The day happened to bring almost perfect spring weather, and the entire Zoological Park had an excellent attendance of 55,073 persons.

In Thirteen Languages

Last year the Civil Affairs Division of the War Department made a one-reel motion picture in the Children's Zoo for distribution in Germany, Japan and Korea, as part of a program to show "the American scene." The picture has now been taken over by the State Department and is being distributed in various parts of the world with a running commentary in thirteen languages. They include: Arabic, Bengali, Burmese, French, Greek, Hindi, Hindi with Urdu titles, Persian, Portuguese, Spanish, Tamil, Telugu and Turkish.

Aquarium Men Present Papers on Rare Fish Tumor

The Forty-first Annual Meeting of the American Association for Cancer Research, held in Atlantic City in April, was attended by Drs. Nigrelli and Gordon, who presented two papers on a rare type of tumor developed in the fishes in the Aquarium's Genetics Laboratory. These tumors differ from the great majority of pigmented cancers in that they involve red pigment cells as well as black ones. They go by the descriptive name of erythromelanomas.

Previous to this work, only eight of these red-and-black pigmented cancers had ever been reported in fishes by scientists anywhere. Dr. Gordon, however, obtained eight in a single brood and since that time has bred several more—all from one special strain of Platyfish X Swordtail hybrids. An account of the genetical principles involved, illustrated in full color, recently appeared in the internationally distributed British journal *Endeavour*.

JUNGLE VIEW: Newsletter from Our Trinidad Station

(*Continued from page 75*)

living organisms to compare with these in weird beauty and bizarre unreality.

To end on a light note, I offer a short installment (on the level of the Perils of Pauline in the early movies) of the comedy and tragedy of Chiri, our Capuchin monkey. As I wrote Report Number Three, he was clutching a banana on the roof of the kitchen. To a brief, four days later, by pitting our combined brains against his, after long and patient watching behind a shutter, we were able to pull a string, close a door and entrap him, when he thought he was unobserved. For a week he thoroughly enjoyed confinement. Then by a double leap from perch to the back of Julia, our tweenie maid who was feeding him, and thence out the door, he again won his freedom.

Now came a hardening of our deepest sentiments and we kept him from all food and drink. Our hearts were torn when he came down, almost within reach, hanging by his tail, watching us at luncheon, and chewing on an unripe lime which he had twisted off a tree, his grimaces showing what he thought of such acid fodder. But he kept stripping off our orchids, and we feared for the hummingbird nests in nearby trees. He got more and more bold, and finally Jocelyn displaying a tempting dish of water, his thirst overcame his discretion and he came within reach. Disregarding the risk of a severe bite, she seized his tail and transported him, yelling to high heaven, to his palatial cage. The servants promptly heaped fruit, honey, milk, every luxury upon him, and there Chiri romps today, fenced in by two stout bolts. He accepts or discards the various insects we offer, thereby adding to scientific knowledge, acquiring merit in our eyes, and cheerfully earning his board and lodging from the coffers of the Zoological Society.

PUBLICATIONS OF INTEREST

HOW TO DRAW THE DOG. By Diana Thorne. x+84 pp. Fully illustrated by the author. Watson-Guptill Publications, Inc., New York, 1950. $4.00.

A beautifully illustrated how-to-do-it book, giving detailed, practical advice on all phases of dog-drawing by a well-known master of the subject.

The book begins by looking over the chances for success in this specialized field. It wisely advises the beginner to first get a basic, general art foundation. There is a chapter on recommended materials and techniques, on procedures, from drawing resting dogs to the more difficult business of wide awake subjects. Such questions are answered as where and how to obtain the necessary models, how much knowledge of anatomy is needed, how to make quick sketches and the use and abuse of photographs in drawing.

Dog lovers will want to own this book for the sake of the many charming illustrations. — Lloyd Sandford.

AMERICAN SPIDERS. By Willis J. Gertsch. 285 pp., 44 pl. in color, 67 in gravure. D. Van Nostrand & Co., New York, 1949. $6.95.

If you want to learn how to go fishing with a spider web, whether spider females really eat their mates, what the tarantelles were all about, why a trap door spider craves privacy, and whether you should really start worrying about the prevalence of black widows — here is the book for you. Even if you have never had any conscious cravings for such knowledge, Dr. Gertsch's accounts will certainly lend you vast authority during your next encounter with an arachnophobic friend.

Naturalists of many kinds will be grateful for this addition to the New Illustrated Naturalist series. In it they will find both reliable information about a fascinating group of animals and also a challenge to solve many puzzles of spider life. These gaps in our knowledge range from the details of the lives of nearly every species to the operation of spider equivalents of ears and noses, which still remain highly mysterious. Technical zoologists, too, whether their work lies with spiders or other groups, will discover, in convenient form, a synopsis of current knowledge for comparison and reference. Although simply written, Dr. Gersch's work has the inimitable imprint of scientific authority.

It is good to find, however, that the author emphasizes general aspects, rather than systematic accounts of individual species which can easily be found elsewhere. He groups about half of his material under such headings as "The Life of the Spider," "Silk Spinning and Handiwork," "Courtship and Mating," and "Economic and Medical Importance." His handling of the chapter on evolution is especially satisfying. After his lucid résumé of potentially dull facts, you emerge with a lively picture of an early spider, a creature groping about in the tropical jungles of our country's past, and spinning a little in amateurish inefficiency.

A survey of spider classification, with particular mention of genera of special interest or abundance, occupies the remainder of the book. Here again, habits, relationships and folklore are stressed, rather than merely structural peculiarities.

The photographs are technically and artistically superb. A useful index is included, as well as a list of selected references which will put any newly aroused amateur on the trail of specialized information. — Jocelyn Crane.

IN WOODS AND FIELDS. By Margaret Waring Buck. 96 pp., 230 illus. Abingdon-Cokesbury Press, Nashville, Tenn. $3.00 (cloth); $1.75 (paper).

A primer of the out-of-doors, designed for the child who wants a catalog of the common creatures and plants likely to be encountered in the country at any season. The information is accurate, presented on a child's level, and should be an adequate introduction to nature for most ages up to 10 or 12 years. Miss Buck's illustrations (in black and white) are pleasantly varied and create an invitation to look and read, no matter at what page the book is opened.

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(Between March 1 and April 30)

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YOUR SOCIETY

Needs your help!

WE NEED MORE MEMBERS.

We need more people who have a keen interest in the Zoological Society's program of Conservation, Education and Research, who want to have a share in the important and exciting things we are planning and doing.

Everyone who loves Nature, everyone who is conscious of our national need for conservation, is a potential Member of the New York Zoological Society.

By these tests many of your friends must qualify. Won't you serve your Society by calling the desirability of Membership to their attention? They and you will gain in Society services as the Membership grows—to say nothing of the stimulation of participation in the Society's activities.

A simple postcard addressed to the Membership Department at the Zoological Park (New York 60) will bring you full information about the Society's program to aid you in soliciting Membership. You will also be supplied with Membership application blanks.

We truly need your help in this important matter. It would aid us mightily if each Member were to bring in at least one Member more.

Fairfield Osborn

President,

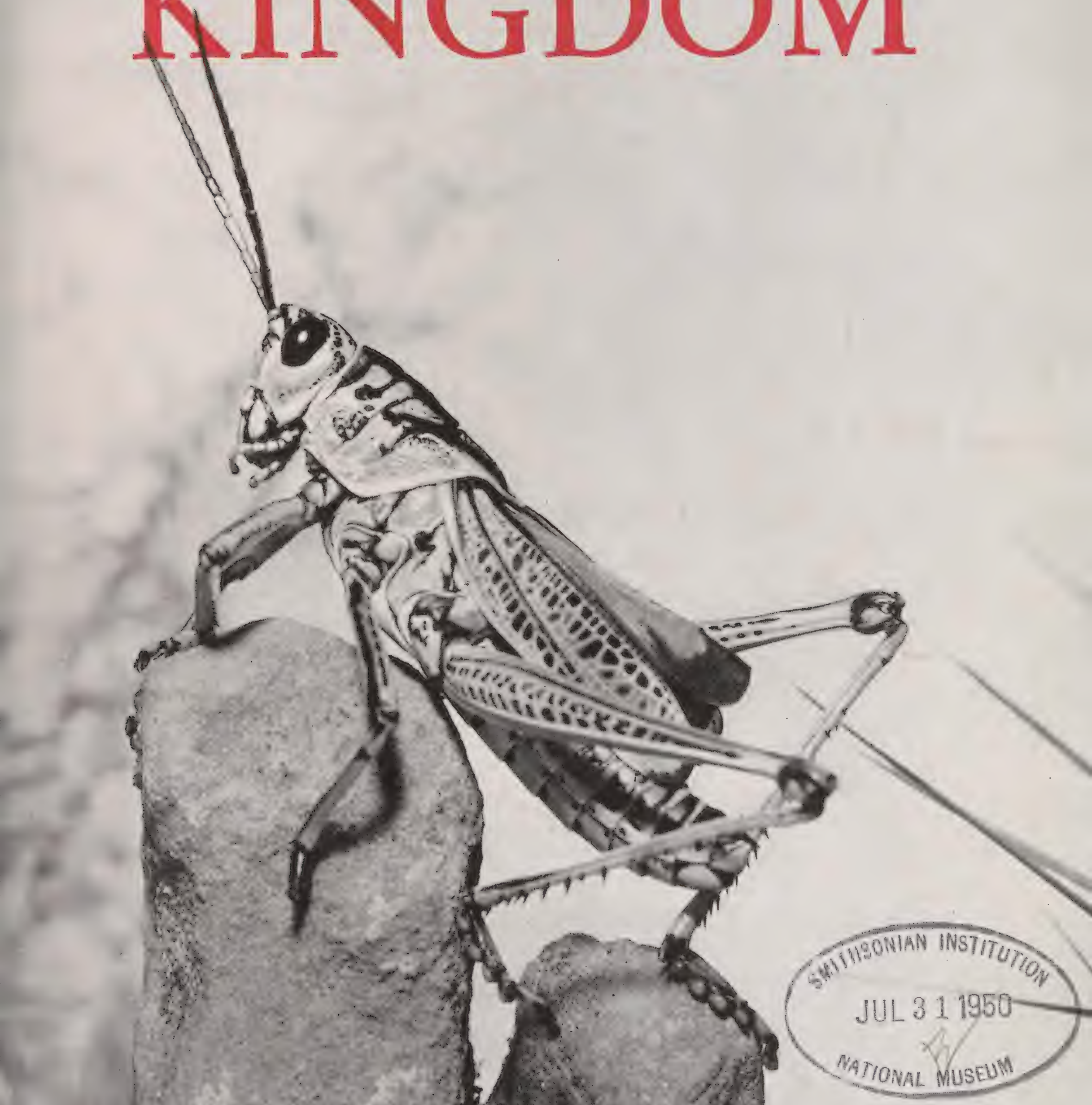
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ANIMAL KINGDOM



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THE MAGAZINE OF THE NEW YORK ZOOLOGICAL SOCIETY

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ANIMAL KINGDOM

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Aspects of Present-Day Conservation

Extracts from recent writings and addresses by FAIRFIELD OSBORN, *the Society's President.*

NATURE may be a thing of beauty and is indeed a symphony, but above and below and within its own immutable essences, its distance, its apparent quiet and changelessness it is an active, purposeful, coordinated machine. Each part is dependent upon another, all are related to the movement of the whole. Forests, grasslands, soils, water, animal life – without one of these the earth will die – will become dead as the moon. (*Our Plundered Planet*).

The meaning of Conservation is not simply one of method or technique. In its broadest sense it is a way of life. It involves processes that are social and ethical as well as material. It bears on the structures of economy and of law. It involves questions as to numbers of people. It calls for far wider application of techniques and knowledges, most of which are now at hand. Science and education are its allies. It demands understanding of the relationship of human beings to natural processes. Its ultimate purpose aims not only at the subsistence but at the welfare of all people. (*Address: Philadelphia Forum*).

When we analyze the business and industry of this great nation of ours and study the nature of the activities of everybody who is at work, we find that well over half of our national economy, in all its categories, is based upon the use and handling of the products of the land. The conservation and wise use of our renewable resources is the foundation of our economic prosperity. In effect, Conservation is everybody's business. (*Address: Herald-Tribune Forum*).

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JUL 31 1950

DEAMER THE LEMUR



Photo by Helen & Samuel Grove

DEAMER THE LEMUR joined our globe-trotting Naval Medical Research Team the first night we were camped in the hinterlands of southern Madagascar. We were delighted to adopt the scared, saucer-eyed little beast that came to us clutching the kinky black hair of a native, who only that afternoon had snared the mother lemur and thrown her into a stewpot. The orphan was hardly a mouthful, and so after supper the satisfied diner offered him to us as a getting-acquainted present. He joined the Navy and saw the world, but that evening we scarcely foresaw that soon our mascot would develop into an ultra-sophisticated member of human society.

Within a few months the little animal had become so civilized that he accepted aeroplanes and automobiles as commonplace but screamed in terror when he saw an adult of his own species in the Madagascar Zoo. He raced for safety when a moth flew by, but stole the show at a Washington press conference and reduced admirals to grinning boys as he tugged at their hair.

By HARRY HOOGSTRAAL
Field Research Associate
Chicago Natural History Museum

All Photographs by the Author
Unless Otherwise Indicated

Our first job after obtaining the mascot was to find a name for him. One of the members of our three-man team was a Medical Research Assistant, Chief Deaner K. Lawless, USN, and the alliterative attraction of Deaner and lemur quickly suggested the name of Deamer the Lemur. The Chief's surname seldom had to be applied to the lemur, for he was an unusually law-abiding animal! Deamer became the lemur's formal name, but we also used a nickname, Maki, the word employed by Madagascar natives to designate this species of lemurs. Soon he responded to either name with good natured alacrity.

The group that Deamer joined was the Research Team of the United States Navy Medical Science Group, which was associated with the University of California African Expedition. After nine months of research in Africa, Captain J. J. Sapero (MC) USN, one of the Navy's outstanding research scientists, who was in charge of the naval group, had sent us to Madagascar in the Indian Ocean off Africa to make the first survey ever attempted on the blood diseases of the wildlife of the island. Our object was to find new diseases and new laboratory animals for use at the Naval Research Institute at Bethesda, Maryland. Among other things, this was part of the still-continuing effort to learn more about the peculiarities of the malaria cycle in man and animals in the hope of discovering a perfect drug for the prevention and cure of malaria.

In Madagascar, *Lemur catta,* which is the scientific name of Deamer's species, is confined to the southwestern lowlands and to part of the adjacent great central highlands. The species is equally at home on the ground or in trees, and its habitats range from treeless, rocky areas to not-too-dense forests. Single animals are sometimes seen, but more often they travel in bands of four to a dozen or more. One often sees them near native villages; indeed they display remarkably little fear of man. Watching a band of lemurs in a tree, eating, chattering at one another, engaging in tussles, playing a game of tag with a vocal accompaniment as happy as a group of children, or just lazing about cleaning each other's luxuriant fur, often gave us a pleasant respite from the arduous day's work.

When we first got Deamer, we decided to study his food preferences. (The military away from home is always seriously concerned with food of any kind.) We were on a scientific mission, and just being good company didn't pay Deamer's way; he would have to contribute to the scientific findings in this simple manner at least. Champagne and beer came first on the list. Each day the list of implausibles grew: guinea fowl, steak, lobster, fried fish, sugar, peas and beans, bread and butter, mustard, pickles, spaghetti, in fact everything that we ate and drank except coffee, and eventually he even took a liking to coffee. So we decided that Deamer was a lemur, not a guinea pig, and wrote off our noble experiment with the words "practically omnivorous."

One of Deamer's food habits was of special interest to me. I noticed that whenever he could find a piece of charred wood he gnawed happily



Photo by Catherine Hoogstraal Walker

The lemur developed an insatiable thirst for water, which may have been a somewhat neurotic reaction to strangeness of its surroundings while traveling.

at it. Carbon-eating had interested me two years earlier in the Philippines when observing the habits of the tarsier, a more specialized relative of the lemur group. Old literature and contemporary folklore claims that the tarsier subsists on charred wood and carbon. It had taken me some months of backbreaking work to find large populations of this rare animal, and among other things I wanted to find out whether there was any truth in the legend. The species had even been given its specific name, *carbonarius,* because of this story. But try as we might, we could never get our captive tarsiers to accept the carbon course that was offered to them among other delicacies. As a result I had assumed that there was little if any factual basis for the legend, but after having watched cousin Deamer I am beginning to wonder whether our tests were extensive enough or carried out under the proper conditions.

Flowers and leaves are appetizing food for *Lemur catta* in nature, and this is attested by the predilection of our pet for bouquets and house plants. In Madagascar whenever we were invited to dinner Deamer avidly attacked the bouquets, and though otherwise he usually obeyed quickly when ordered not to do something, we had considerable difficulty in calling him off. However flowers in Madagascar are plentiful and cheap and our hosts always urged him to eat his fill.

Among the natural foods of *Lemur catta,* fruits and seeds form much of the bulk. A band of lemurs follows the circuit of seasonal fruits as they ripen in the trees in its area. When we were in the Tulear district the "kili" or tamarinds were ripe and bands of "maki" could be found in the biggest trees almost any morning or late afternoon. It was most amusing to watch them sitting erect on a branch, leaning against the trunk, legs stretched full length on the branch, reaching with their hands for a nearby tamarind. They leisurely picked the fruit from its sticky cover and ate with attention divided between the fruit and the antics of the already satiated members of the band frolicking in nearby trees. Wild figs are another favorite food, and, I suppose, furnish a part of their meat fare too, for I have found wild figs usually heavily infested with insects in the

tropics the world over. Some observers report that this species also eats the eggs and nestlings of birds.

The juicy fruit of the prickly pear cactus is a delightful dry season viand for humans or lemurs. The thick cover of the fruit, bristling with thousands of tiny needles, is easily and quickly stripped off by the long canine teeth. Lemurs often raid bananas or other domestic fruit trees and only then do these otherwise innocuous animals arouse the ire of their human neighbors.

One often reads in popular and scientific literature that lemurs are nocturnal animals. This is true of most if not all of the lemurs found in other parts of the world, but of the almost forty kinds in Madagascar the majority of the larger varieties and some of the smaller ones are active principally by day. When napping during the day, Deamer sat with his head bowed between his legs and his tail around his neck, or on his side curled up in the same relative position. *Lemur catta* in nature usually naps during the heat of the day. At night the bands sleep more or less huddled together in the highest trees. On very dark nights they can see poorly if at all.

A *Lemur catta* mother carrys her young astraddle her back until the baby is well over half grown. A larger youngster may venture away a bit to investigate its surrounding but dashes back and climbs aboard when the mother calls. It is said that for the first few days after birth the baby is carried underneath the mother the way monkeys usually carry theirs. We have seen different *Lemur* species carry three-fourths grown young wrapped sideways around their middle with head, legs, arms and tail sticking out everywhich way. When thus-encumbered females jumped, it was difficult to tell just what was happening! *Lemur catta* bears one young at a time, but there are records of two at a birth. Apparently when first born the little ones are sparsely clothed with hair, but we have not seen any at this stage. What surprised me about young Deamer was his inability to bite into or tear apart fruits of the consistency of apples. The females must have to give their offspring considerable assistance with breaking into food for some time after they are weaned.

The physical structure of all lemurs is of intense interest to scientists because of the close relationship of the lemur group to man. Man, monkeys and the higher apes are suspected of having evolved from primitive lemuroid stock. Several important studies have been made on various phases of lemur anatomy, but surprisingly much of this comparative research remains to be done. The greatest gap in our knowledge is in the field of functional anatomy, the study that concerns itself not just with the size of shape of a bone, muscle, or organ but with the method in which the animal utilizes these structures. As a contribution to this important field of research, after our return Captain Sapero allowed us to turn Deamer over to the Chicago Natural History Museum. He is now living in the home of Doctor Dwight Davis, Curator of Anatomy at the Museum, where, besides becoming an established member of the family, he has become the object of close observation for the benefit of science.

Even during the first few weeks of his stay with the Davises, Deamer has been able to pro-



Photo by Catherine Hoogstraal Walker

Spiced foods of all kinds, and particularly catsup, were relished by Deamer. Eventually it appeared that there were very few foods he would not eat.



To trap lemurs, natives cut a strip across a narrow neck of forest, bridge it with a log, and then set a noose on the log where the lemurs naturally walk.

vide the answers to several important questions. For example, anthropologists were much interested in knowing whether lemurs are able to move their eyes, and Doctor Davis has already been able to tell them yes. When Deamer picks up a raisin and examines it closely before stuffing it into his mouth, his eyes do move closer together. This simple observation will assist in the better understanding of the functions and anatomy of the lemur's eye.

Just what does our little friend look like? Well, most people regard him as a monkey with some raccoon affinities. He does look much like a happy little monkey, to which he is closely related, but he is not at all related to the raccoons, despite a similar alternately black-and-white ringed tail. We estimated that he was a couple of weeks old when he joined us, and a month later his head and body measured eight and a half inches long, his tail twelve and a half inches. At that time he weighed about fourteen ounces. Six months after the record began, he weighed twenty-eight ounces and his head and body were thirteen inches and his tail eighteen and a half inches long. His soft, thick fur is a delicate ashy-gray color tending towards darker gray along his back. His face, ears, chest and underparts are snowy white except when he has found something of interest in the coalbin. A hot, soapy bath quickly restores the original color after these escapades. As he grows older the fringe hairs on his arms and legs and the hair on his tail are becoming noticeably longer.

Among the Primates, the order of animals that includes lemurs, tarsiers, monkeys, apes and men, in which the tendency is for the lower part of the face to be shoved beneath the eyes, the true lemur's muzzle is exceptional for its narrow, fox-like elongation. Chiefly for this reason our species has been referred to in literature as the Madagascar cat, the Madagascar fox, or the ring-tailed cat.

The lemurs have big, bright eyes with a reddish iris and a black pupil reduced almost to a pinpoint in bright sunlight and enlarged greatly as the light becomes dimmer. Their arms are shorter than their legs, and the curious tail-end-up appearance these animals have when they walk or run on the ground belies their swiftness and agility in or out of trees. The long, bushy tail is held straight up or curled forward over the back when the lemur is on the ground. It is a valuable rudder or balancing organ when jumping among the trees. The tail is not prehensile;

that is, it is not used as an extra grasping organ.

Among the anatomical peculiarities of *Lemur catta* several features of the dentition are of interest. We have already noted the long canine teeth of the adults that are used for stripping off the coating of the fruit of the prickly pear cactus. The canine teeth of the males are longer than those of the females and are used for establishing superiority during the mating season. The females in turn use theirs to ward off undesired advances. Just before we left Tananarive, a magnificent male in the zoo was bitten so severely in the neck by his disinclined mate that he died within a few hours.

Except for such purposes these lemurs probably have little defensive need for their canine teeth. There are few predacious animals on Madagascar, and only one so large that it might cope with an adult "maki." This is the fossa, a large civet that probably takes some toll. It is likely that boas, of which there are several species that grow to some size, also attack lemurs, as might a few hawks and owls.

The most remarkable feature of the teeth of *Lemur catta,* shared by most other lemurs, is the row of lower incisors (front teeth), which resembles a comb with closely-set teeth. The animals spend long hours running these "scraper teeth" through their own thick fur and through that of their companions. When one grooms the other in this manner it usually responds in kind, with a low, cat-like purr of happiness.

Another useful toilet tool which this and most other lemur species possess is a grooming claw on the second toe in the place of the nails on the other toes. This claw is sometimes drawn through the coat as a dog might do, but is chiefly used to reach areas, such as behind the ears, which cannot be reached by the teeth. With all these grooming devices, lemurs manage to keep themselves immaculately clean.

Besides the nails and grooming claws, the lemur's hands and feet are remarkable for their thick, leathery pads on the soles, palms and digits. The opposable thumb and first finger in addition to the strong, elongated digits are in themselves no little asset in running, clutching or grasping a branch on the jump. But being further fortified by these thick pads, the animals can glide over slippery rocks or find firm grasp on a branch after a tremendous leap.

The pet lemur makes a variety of sounds. He

Although some colonies of* Lemur catta *live in rocky, treeless areas, most lemurs are not as much at home on the ground as they are high in the forest trees.



is sublimely happy when being combed, petted or scratched, or when going to sleep, and purrs like a kitten. In Madagascar when he dashed about our mosquito nets he emitted a fairly loud, throaty chuck-chuck-chuck. In his new home in America he makes almost the same sound, as well as a loud bark when he scrambles up a curtain upon seeing a dog. If confined to a room without his friends he gives forth with a loud, shrill whine. Twice when riding on our shoulders in Madagascar he saw large hawks soaring overhead and then he gave a loud warning call which was so sudden and so peculiar that I am at a loss to describe it. Wild lemurs at play in trees call and bark to one another almost constantly.

Before we finish these observations on our pet and on wild specimens of *Lemur catta,* it is well to stress that these facts apply only to this species and not to lemurs in general. Zoological literature is full of vague generalizations and misstatements about lemurs. It is often assumed, for instance, that lemurs are nocturnal animals, whereas a fair number of the Madagascar species are not. *Lemur catta* is often used as an example of the true lemurs because it is the best known species, but actually its habits are unique among even its closet relatives.

The killing of lemurs is prohibited by an international agreement, except on permission of scientific authorities for scientific purposes. While our species of lemur is surprisingly common in many parts of its range, it probably is in need of some degree of protection. Misguided "hunters" on an afternoon jaunt out of Tulear can and do shoot at sitting lemurs more easily than at a sitting duck. Meat-hungry natives relish the flesh of all the larger species of lemurs and snare them with ease, a pastime they apparently seldom if ever engaged in before the coming of the white man. The fact that this species inhabits land of

The lemur's lower front teeth resemble a comb and these efficient scrapers are used by the animal to groom its fur—or a friend's skin!





Deamer the Lemur could always be counted on to take an interest in the expedition's activities, generally from somebody's shoulder or atop a man's head.

marginal or sub-marginal agricultural value, and that it proves itself exceptionally adaptable to changed and varied conditions, seems to assure its survival in the face of man's onslaughts.

Several strictly arboreal species of lemurs have become extinct on Madagascar in the past few hundred years because they had no place to go as the forests were cut and burned over. Until fairly recent times much of Madagascar was heavily wooded. Now forests remain only in the rugged eastern mountains and foothills. The decimation of the Madagascar forests has been one of the most thorough and widespread in the world. The pity of it is that it has been accomplished by one of the least dense populations of the world and by ignorant tribes who derived only the slightest short-term return from the land.

A few lemur species have benefitted from the loss of Madagascar's original forest. These are chiefly the dwarf and mouse lemurs, which thrive and multiply in the second growth scrub and forest that takes over the land after the original forest has been destroyed and the land abandoned. Then these small lemurs often become "as common as rats."

Zoologists know Madagascar as the home of lemurs. About forty kinds live there today, fully half the number known from the whole world. The other half of the lemur group is thinly distributed through western and eastern Africa, southern India, the East Indies, Ceylon, Borneo and parts of southern Philippines. More than half of the Madagascar kinds are distinct, well-known and readily identifiable species. The remainder are known from such fragmentary collections, vary so from locality to locality, and have been the subject of so much indiscriminate naming that their classification is still in much need of study. A thorough comparative collection, made over a period of years by an enthusiastic scientist afoot in Madagascar, is the only solution to our complete understanding of the evolution of lemurs. It is a challenging opportunity for any naturalist.

Because of their close relationship with man, the lemurs present many especially interesting problems. When any of the questions can be answered by so delightful a pet as Deamer the Lemur, our sometimes tiresome search for facts may become entirely a pleasure.

STRANGE ANIMAL LURES



By JAMES W. ATZ

OF ALL THE MANY ODD WAYS animals catch their prey, none is more intriguing than the predator's use of part of its own body as a lure. Any creature equipped with a "built-in," mobile lure or fishing rod, complete with casting apparatus and bait, would certainly seem worthy of more than casual attention.

As a matter of fact, angler fishes have excited curiosity and wonder since Aristotle's time. The use to which they put the peculiar, fleshy tab, attached to the end of a long, flexible spine located over the mouth, could only be surmised, however, until relatively recently, when the feeding behavior of the European Angler was at last seen and described.[1]

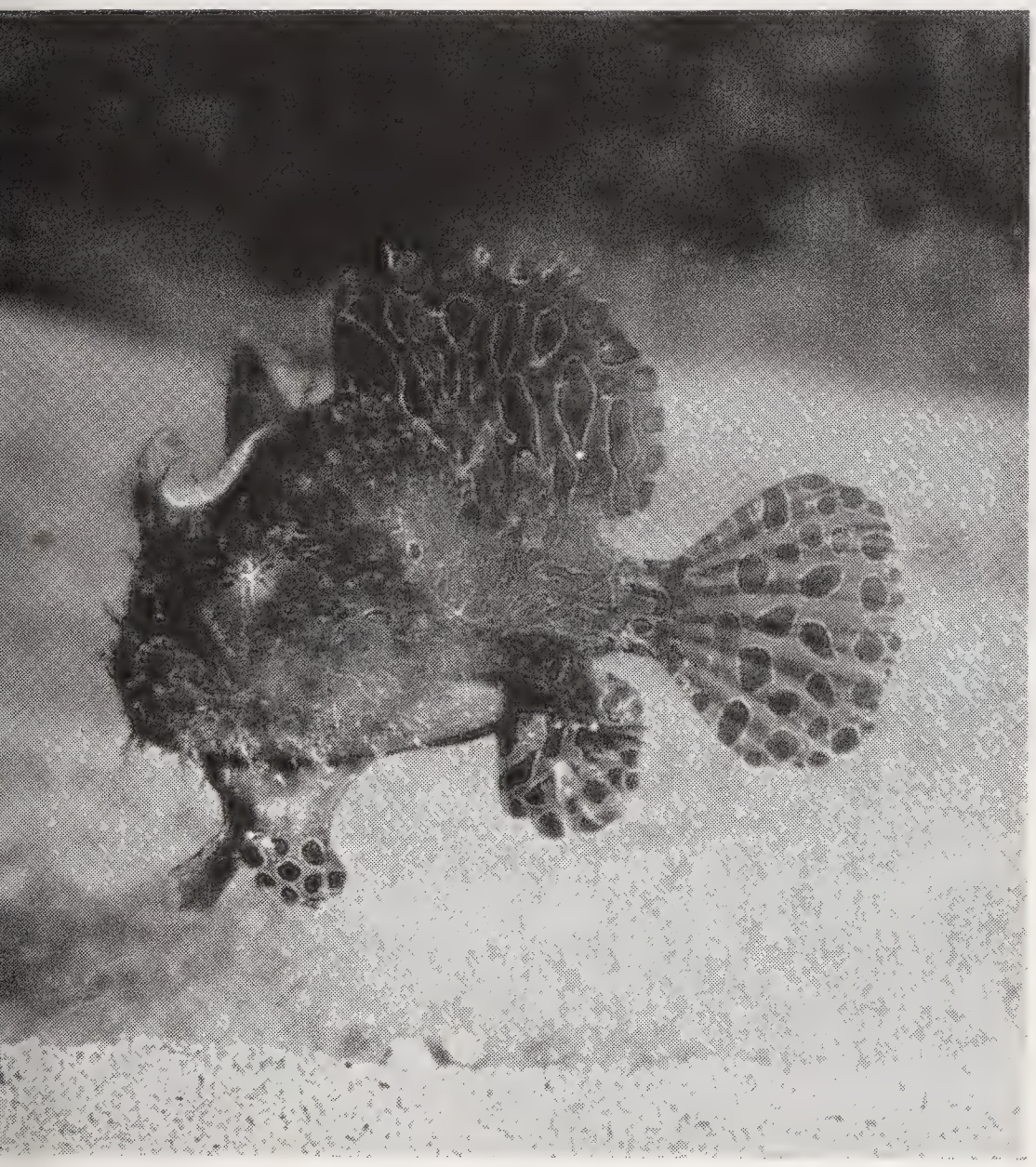
The Angler, *Lophius piscatorius,* inhabits the bottom of the eastern shore of the Atlantic Ocean, sometimes in quite shallow water. A very closely related species, often called the Goosefish, *Lophius americanus,* occurs along the eastern coast of North America. Both species are repulsive-looking fishes with a body that is "all head" and a head that is "all mouth." Behind the wide, flat head, which occupies almost one-half of the total length, the body tapers so sharply to the tail that the fish looks like a gigantic tadpole at first glance. Reaching lengths of four feet, these Anglers have so large a gape that they can, and do, swallow full grown ducks, although it is doubtful if they could make away with a mature goose, as the popular name indicates. Projecting just above the center of the wide mouth is a long, whip-like ray at the end of which is a small tag of flesh which acts as the lure.

Three specimens that lived in the Plymouth Aquarium in England were observed by D. P. Wilson who noted that they erected the spine bearing the lure whenever they were hungry and a suitable fish came anywhere near them. "The lure is quickly jerked to and fro and, as the rod is almost invisible, the bait . . . simulates some tiny creature darting about. An attracted fish rushes up in an endeavor to catch it; the bait is skillfully flicked out of its way just in time and, with a final cast, is dashed down in front of the mouth which may open very slightly. The intended victim, still following the bait, turns slightly head downward; it is now more or less directly head-on to the angler's mouth. The jaws snap faster than the eye can follow and the tail of the prey is next seen disappearing from sight through the firmly closed mouth. As far as I have been able to observe, the bait is not actually touched by the victim before it is caught. . . .

"Besides the quick lashing motion of the lure just described, some anglers occasionally combine

with it another movement. Every now and then the rod is depressed until the bait hangs just in front of and rather below the level of the lower jaw. It is then for a few minutes given a curious vibratory movement, after which the sharp flicking is again resumed, the bait being jerked over wide arcs in various directions."

While cruising on the yacht *Antares* through the West Indies in 1932, Dr. William Beebe captured a fine specimen of the Reddish Frogfish, *Antennarius scaber,* one of the smaller relatives of the angler fishes. "Its lure was, in size, shape, color and movement, a perfect imitation of a wriggling, grayish-white worm. While still on board the *Antares* it devoured three of its own cousins, and a beautiful blue-starred demoiselle. Twice I watched the process, and both times while the prospective prey was at least two inches away, the frogfish opened its mouth and with no apparent effort, created such a maelstrom, such an irresistible current, that the human eye could not see the fish disappear. It simply vanished from sight, the lure was tucked away and we imagined a gleam of satisfaction in the fishy eye."[2]



This specimen was presented to the New York Aquarium, and when it was placed in a tank with some seahorses it promptly ate three of them. So entertaining were its feeding habits that everyone wanted to see it eat. When it finally died, the cause of death was suspected to be indigestion or some associated disorder resulting from overeating. Other species of frogfishes have been observed working their lure to catch fishes, and another distant relative of the Angler, the batfish, has recently been discovered to angle for its dinner.[3] The batfishes' knob-like bait is affixed to a short stem that moves in and out like a plunger, the mechanism being completely hidden when not in use.

Altogether the most bizarre of all the fishes possessing a rod and bait are the deep-sea anglers. These inhabitants of the ocean's lightless depths are usually small, but a few reach lengths of about three and a half feet. Unlike *Lophius* they do not habitually lie on the bottom, doing their fishing instead in mid-water, 1,500 to 15,000 feet below the surface. In these fishes the lure is luminous — as indeed it would have to be in order to operate effectively in total darkness. It has been demonstrated in a number of cases that the light is not produced by the fish itself, but by special bacteria living inside the bait. Biologists call such an intimate living together of two dissimilar organisms, *symbiosis.* Here, both partners benefit from the association, the bacteria getting a home and nourishment while the fish is provided with all-important light.

There is a fantastic variety of styles among the fishing apparatus of deep-sea anglers. Some are short, others are as much as three times as long as the total length of the fish. Some are tipped with simple, bulbous lures, others with weirdly branched or shaped ones, often bearing peculiar tentacles or papillae. So little is known about these fish that it would be most hazardous to try to explain just what is the significance of this great variability.

These two pictures show the Reddish Frogfish using its lure to attract a small fish into range of its capacious mouth. In the lower photograph, the minnow has been engulfed; it was swallowed instantly.

A quite different type of lure is employed by a Mediterranean species of Star-gazer which makes

a habit of burying itself in the sand so deeply that only its eyes and the upper part of its mouth are exposed. "At times it protrudes from its mouth a little red filament, which represents a membranous process of the valve of the lower jaw. This is made to move about on the sand, crawling, wriggling, contracting and expanding – in short, imitating to perfection the movements of a small worm. There can be little doubt that this





Four Photos by Ross Allen

serves as a bait to lure small fry within reach of the concealed jaws of the Star-gazer, and the deception is facilitated by the soft, dusky light of the shallow waters in which it usually operates. Another species from the coast of West Africa uses a broad membranous flap, gleaming white in colour, for the same purpose."[4]

Fishes are not the only creatures that have developed apparatus for attracting prey within range of their jaws; several reptiles have also proved adept at doing so.

The Alligator Snapping Turtle is provided with a worm-like structure lying along the middle of its tongue. This is pink or red in color and stands out prominently against the darker lining of the mouth. This arrangement was first noted by Dr. Raymond L. Ditmars, the late Curator of Reptiles at the New York Zoological Park, and he described how the structure was moved, simulating a squirming worm, while the turtle lay quietly on the bottom with its mouth open.[5] No one has ever seen any animal attracted by this lure, but all agree on its great similarity to a worm and on the apparent use to which the Alligator Snapper puts it. One other turtle, the Matamata of South America, is said to employ movable filaments to attract its prey.

More than forty years ago, Dr. Ditmars noted that when food was introduced into a Reptile House cage containing young Copperheads, the snakes often vigorously wriggled and twisted their bright yellow tails, making them appear for all the world like grubs or maggots. Dr. Ditmars believed it very probable that in these small Copperheads, the tail functions as a lure, and subsequent observations have confirmed his views.[6]

Similar behavior has been noted in the Water Moccasin and the Fer-de-lance, both of which have the tip of the tail colored light yellow when young.[7] In India, Malcolm A. Smith watched the young of *Agkistrodon hypnale,* a relative of the Copperhead and Moccasin, as they waved their tails. Small geckos were so much attracted to these structures that they actually bit them – and were then struck by the snakes and subsequently eaten.

It remained for E. Ross Allen to record this most interesting phenomenon photographically. The receipt of a female Cantil, *Agkistrodon bilineatus,* from Mexico, together with her new-born brood, at his Reptile Institute in Florida, gave him the opportunity to accomplish this. Allen soon noticed that the baby snakes were keeping their tails up in the air and in intermittent motion. These were bright yellow with gray tips, and while they were being moved they resembled "nothing so much as a wriggling worm twisting about hungrily in search of food. To observe the effect of this lure in actual practice," a Green

Tree Frog was placed in the terrarium with the snakes. "When the frog, attracted by the lure, hopped close to one of the baby cantils the snake struck with lightning-like swiftness." The next day Allen introduced four Oak Toads into the terrarium. "The toads were completely enchanted by the provocative lures. In their excitement they hopped over the snakes, completely oblivious of the danger, snapping repeatedly at the tails, especially when the tails were lowered to within reach. However, the snakes made no attempt to kill the toads. Eight days later four tree frogs were placed in with the juvenile cantils. One frog was immediately enticed by one of the tails and bit at it several times. When one of the snakes struck at it, it missed. Two hours later two frogs were caught and eaten. For the next two days, the tails of the snakes that had eaten were kept down, apparently indicating that the tail lure is only utilized by the snake when in quest of prey."[8]

flattened cutwater is to serve as a lure. Small fishes are doubtless attracted toward the surface either by the sight of the black and red beak moving rapidly along or, more probably, by tiny surface circulation which it produces. The skimmer thus baits its own trail and, upon wheeling and returning, it takes advantage of the duped victims which have risen to investigate."

There is a persistent story in South America that the Jaguar uses its tail in fishing.[9] This water-loving cat apparently enjoys fresh fish as much as its domestic relative and catches them in the same way — by scooping them out of the water with a flick of the paw. The Jaguar has been described as luring fish within reach by tapping the surface of the water with its tail, or by draggling its tail in the water. No fully dependable witness has yet reported that he has seen this. Until that time skeptics will shrug their shoulders — as they have at even stranger stories that sometimes turned out to be true!





Ross Allen's photographs on this and the preceding page show young Cantils with their tails in luring position—and the very evident inquisitiveness of an Anolis lizard and an Oak Toad. Apparently the lures are used in a provocative way only when the snakes are hungry.

Among birds and mammals there appear to be few authenticated examples of the employment of parts of the body to lure prey. It has been suggested that some birds have heads or crests resembling flowers and that these serve to attract insects upon which they feed, but these casual observations need confirmation. The Black Skimmer, *Rynchops nigra,* habitually flies close to the surface of the water, just breaking the surface with its bill. Dr. Robert Cushman Murphy has observed these birds "turn and cut the surface of the water again and again in the same area during feeding evolutions," and he has "come to the conclusion that the only practical function of the

[1] Gudger, *Amer. Nat.,* 79 (785):542-548, 1945.
[2] Beebe, *Bull. N. Y. Zool. Soc.,* 36 (4):97-115, 1933.
[3] Breder, *Bull. Amer. Mus. Nat. Hist.,* 94 (2):83-106, 1949.
[4] Norman, "A History of Fishes," London, 1947.
[5] Pope, "Turtles of the United States and Canada," N. Y., 1939.
[6] Neill, *Herpetologica,* 4 (5):161, 1948.
[7] Cott, "Adaptive Coloration in Animals," London, 1940.
[8] Allen, *Copeia,* (3):225-226, 1949.
[9] Gudger, *Jour. Mammalogy,* 27 (1):37-49, 1946.

An Amateur and His Camera In the Zoological Park

Photographs by John Masters

FORTY PHOTOGRAPHS made in the Zoological Park by John Masters, an amateur photographer, are on exhibition in the Heads and Horns Museum Gallery this summer; a selection is reproduced on the next few pages.

Mr. Masters works fast. The "Gayal Family" on this page was literally shot between bites while he was having lunch in the Zoo. A quick grasp of picture possibilities is an invaluable aid to any photographer.

Introducing Mr. Masters' photographs in the Gallery, we said about him and his work:

"Anyone can make good pictures in the Bronx Zoo — anyone who has patience and an interest in good photography.

"Whether you have a box camera or a more expensive apparatus makes little difference. The essential is your imagination.

"John Masters, who made these photographs, is an amateur with skill, patience and imagination. He uses an Auto-Rolleiflex camera with a Xenar f 3.5 lens. He made all these photographs without special privileges or facilities; they show what you, as an amateur, can do, too."





Formosan Doe

he Gayal Family



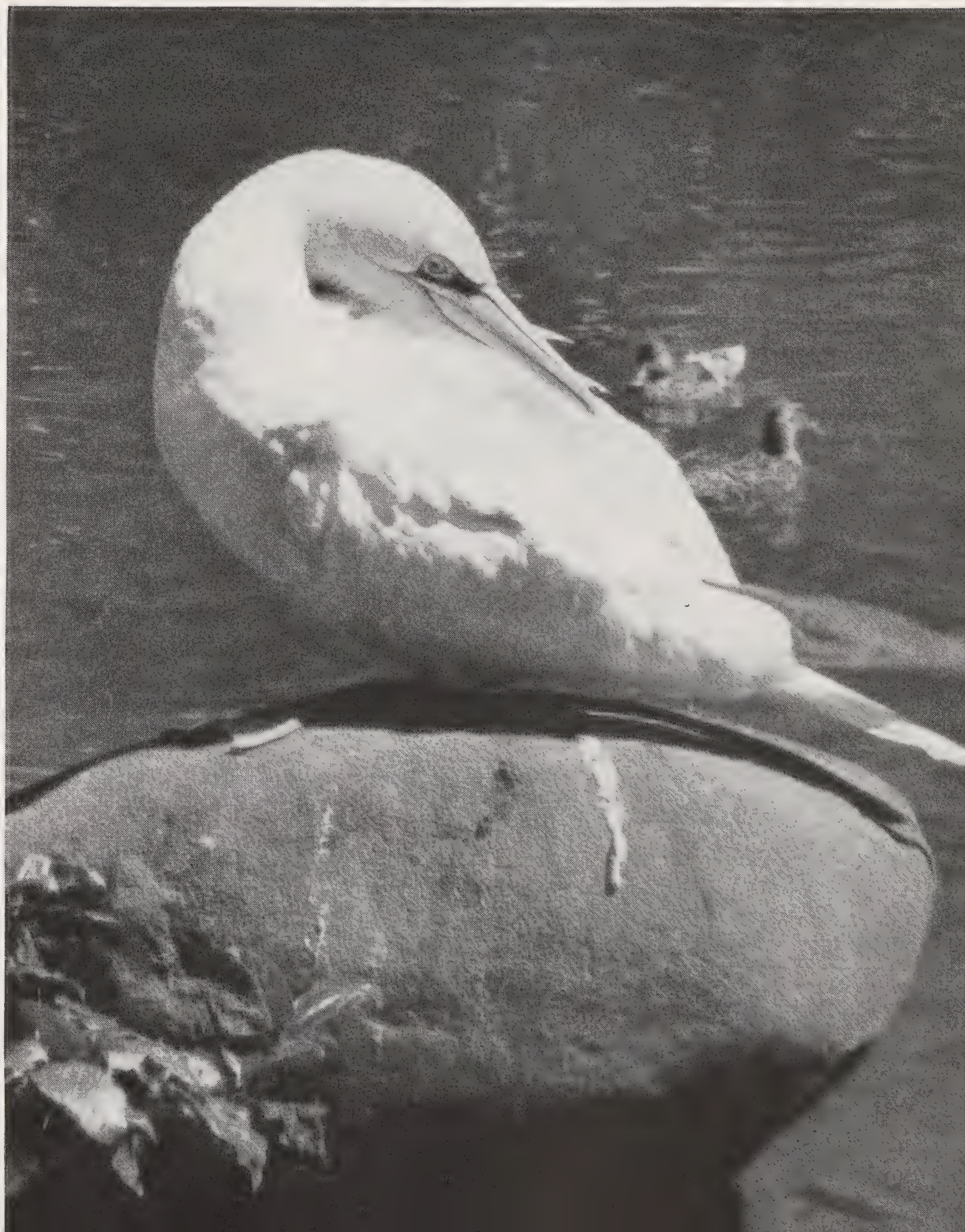
Northern Eared Vulture





Nubian Giraffe

Gannet





This is NOT the house in which Mrs. Cordier conducts her housekeeping for the animals in Ecuador—but it is the only photograph of Mrs. Cordier that our animal collector has sent back from South America. The hut is a native home somewhere on the west slope of the Ecuadorean Andes.

Keeping House for Animals in Ecuador

In mid-July Charles and Emy Cordier returned from Ecuador with a magnificent collection of birds and mammals, gathered on the Andean slopes since they sailed form New York last October 2. While in the field, it is Charles' job to roam far and wide and gather the animals; it is Emy's less exciting but equally important task to stay at the base camp – in this case, in Quito – and do the "animal housekeeping" chores. This is her account of her daily routine.

A Letter from EMY CORDIER

Quito, Ecuador
Sunday, June 18

It is 12:30 P.M. and I have just finished my tea and sandwich and am starting this letter before someone disturbs me. "Ugly," the pet monkey, is outdoors in her cage, sunning herself and grinding her teeth. She goes through a peculiar teething period. Her teeth were all brown on the edges and seem to grow long fast. She has now worn the brown part off until only little specks are left.

I have been so busy since Charles arrived from the Oriente that I sometimes did not even have time to get a drink of water during a period of three or four hours.

There were two new girls to be trained, as Charles' helper left us after he got up here. It seems this fellow only wanted to stay with us until he could make a plane ride, then he wanted

to go home and boast about it. Also, he had some money saved and that had to be spent!

At 5:00 A.M. the cook-girl comes in and boils 5½ cups of rice. By 6:30 this is dry and cold. The other two girls grind carrots, 24 eggs and 3 pounds of meat, one-half raw and one-half cooked. At 6:30 I open the bird room, the heater is shut off and the sunlamp put on. Then starts the procession from the kitchen – bringing in the food to be mixed by me and the cook. One girl starts washing the feeding dishes and the other changes water. I then serve the 80 birds, among which are four insectivores. The cook in the meantime feeds the monkeys, of which there are eight, also in the bird room. When I am through serving, I go upstairs where the 39 Hummingbirds are and change these from honey-water to the Mellen's food formula with the help of one girl. At a quarter to eight every feather and fur has been fed and we have our breakfast. Two girls after that start cleaning cages. One does the house, and I give all the special care to weak or sick birds. Some are in molt now. Ugly gets cleaned and vitamined, and there are toucanets which want to be petted, a tame jay that likes to have her tidbit. The Umbrella Birds get tonic in their water and there are always some newcomers who need to be hand fed.

At 10:30 A.M. the house girl goes upstairs with me to clean the Hummer cages, for I could not let them take the trays and grates out themselves. The cook goes to the market now and leaves the other girl to finish the cleaning of the 70 cages and the two rooms. The five nocturnal mammals are in a separate room. At 11:30 I add more food everywhere and one girl changes water.

"Lutche," a lovely male marmoset, has lost his "wife" up here (she caught a cold during the nights we were without electricity). He has to be caressed once in a while; he actually cries for it. There are "Pepe and Pepita," the lovely Night Monkeys, tame. They get a raisin once in a while and are trained to be lively in the daytime for exhibit. They have soft fur like Chinchillas. Their faces have dark brown stripes from their big round eyes upwards, and one from the middle of the nose up so that they appear like laughing clowns. They embrace and kiss each other, but when it comes to grab the first raisin Pepe takes Pepita by the forehead fur and pushes her away. In another cage are three black marmosets and one gray dwarf who are constantly swiping food from each other but get along well. They will grab my slacks when I stand nearby but are otherwise shy.

The 8½-foot Boa is put outdoors.

(I am running away from this writing every few minutes to see what goes on in the other house.)

Yesterday morning I gave the cook the key to open the bird room while I was drinking my lemon juice with hot water. I heard all three girls scream and saw them run from the room. I ran to see what happened. There was the Boa across the room, coiled a few times around the water bench, her head close to the door. A pail of water which was on the bench had been spilled all over the floor. (At night I had heard a noise and got up to listen, but I thought it was in the girls' room as they had the light on at that moment.) I got around the snake to look at the cage. The little door on one side was open. We carried the cage, which is too heavy for one alone to lift, with the opening toward the Boa's head. It took a lot of persuading until the cook dared enter to help me. I shoved the frightened beast slowly inside, uncoiling it from the bench. This took a half-hour off our feeding schedule and left the three girls all excited. They are still proud of themselves, for all three finally helped – as the tail was left to push in! The carpenter has now made a better lock to the little door.

At 1:00 P.M. all food is augmented. If there is no special work, the girls get one hour's rest. At 3:00 raisins and plantains are cut up for the 4:00 o'clock food change. If I have to go to the Center for some reason the cook cannot attend to, I must do so between 1:00 and 4:00 P.M., but it always means neglecting some chores which should be done in those hours. If Ugly sees me go out she will yell all during that time, so we are turning her cage around to keep her from seeing me.

Among our five nocturnals is a Cusumbu – Night Monkey, they also call them here. I named her "Lastenia." She is tame. At 6:30 P.M. I let her out in the room to play with me a while. She loves to box and be caressed but will not let me pick her up. She is full grown. I bought her from some local people who left Quito. I get her back into her cage after my supper by giving her a



Over such crude but strong bridges as these Charles Cordier penetrated the Umbrella Bird country on the west side of the Andes, and out of these forests he has brought the Long-wattled form.

piece of candy for which she gladly gets locked up for the night. She is too destructive to be left out. We have three opossums from Quito climate and one from the Oriente, which Charles brought, The one old opossum we caught in our kitchen where we keep our food supplies. She was raiding the egg basket so we knew it was not a rat, of which we have caught eight since we have been here. The carpenter made a trap out of a Trogan cage, and Mrs. Opossum was caught at 10:30 P.M. She seems to have young ones in her pouch but I am not very sure as she is too ferocious to be examined.

Our carpenter is making cages constantly and he also has to be supervised. However, he is a good man, the best we ever had. It is a great relief to Charles.

When Charles comes home from a trip there is a great turmoil until all the birds are placed and used to the different diet we can give them here. Equipment has to be taken apart and sunned and cleaned and reassembled, cages have to be cleaned and overhauled, and Charles is usually up to his ears to answer letters.

At 5:30 P.M. all birds and animals are fed and watered for the evening if there are no interruptions, like visitors or the arrival of new birds.

Ugly then sits with me while I am sipping my sherry and has a blue plastic spoon from which she gets a couple of drops which she adores. The cook then gives me all the expenses to note and I do my posting after supper. At 7:00 P.M. the light is put out in the bird room, Ugly is put into flannel for the night in her box, and so are the



This is part of the great collection of birds that Charles Cordier has brought out of Ecuador — a whole dugout load on the Tiputini River as he was breaking up camp and returning to Quito.

other monkeys. The food of the insectivorous birds is taken out also and the cages of these cleaned and the room locked.

Monday, June 19

One morning as I was still alone with the cook, I felt a bit queer. My heart seemed to labor and I thought of what would happen to all the birds if I should suddenly die. I told Laura, "You had better learn to mix this food so you can take care of the birds if something should suddenly happen to me."

I said, "Supposing you should find me dead in bed one morning, your duty would be to feed the birds first and then wait until the carpenter comes in, then send him to the Consul and he would take care of the rest. But remember that you would have to *answer Mr. Cordier if you lost your head and neglected the animals.*" She was half laughing and half crying, saying that I had better go to see a doctor.

The next morning she came in all excited and said, "Oh Senora, my mother said that if you die the police would lock me up because they would think that I killed you." I told her that was why she should call the Consul first so that this would be avoided.

I must close as there is no more time. Am expecting Charles this week and also a man with more birds. Got 23 from him last week. After this there will be no more time to write.

Sincerely,

Emy Cordier



Now Our Penguins Have A House of Their Own

By LEE S. CRANDALL

When our new Penguin House was opened on June 15, 1950, as a feature of Members' Day, it marked the culmination of long years of effort. Our first penguins — a pair of Black-foots — came to us from England on July 5, 1905. Their advent was of historical rather than exhibitional value, for aspergillosis, the mold disease that especially besets penguins, quickly had its way.

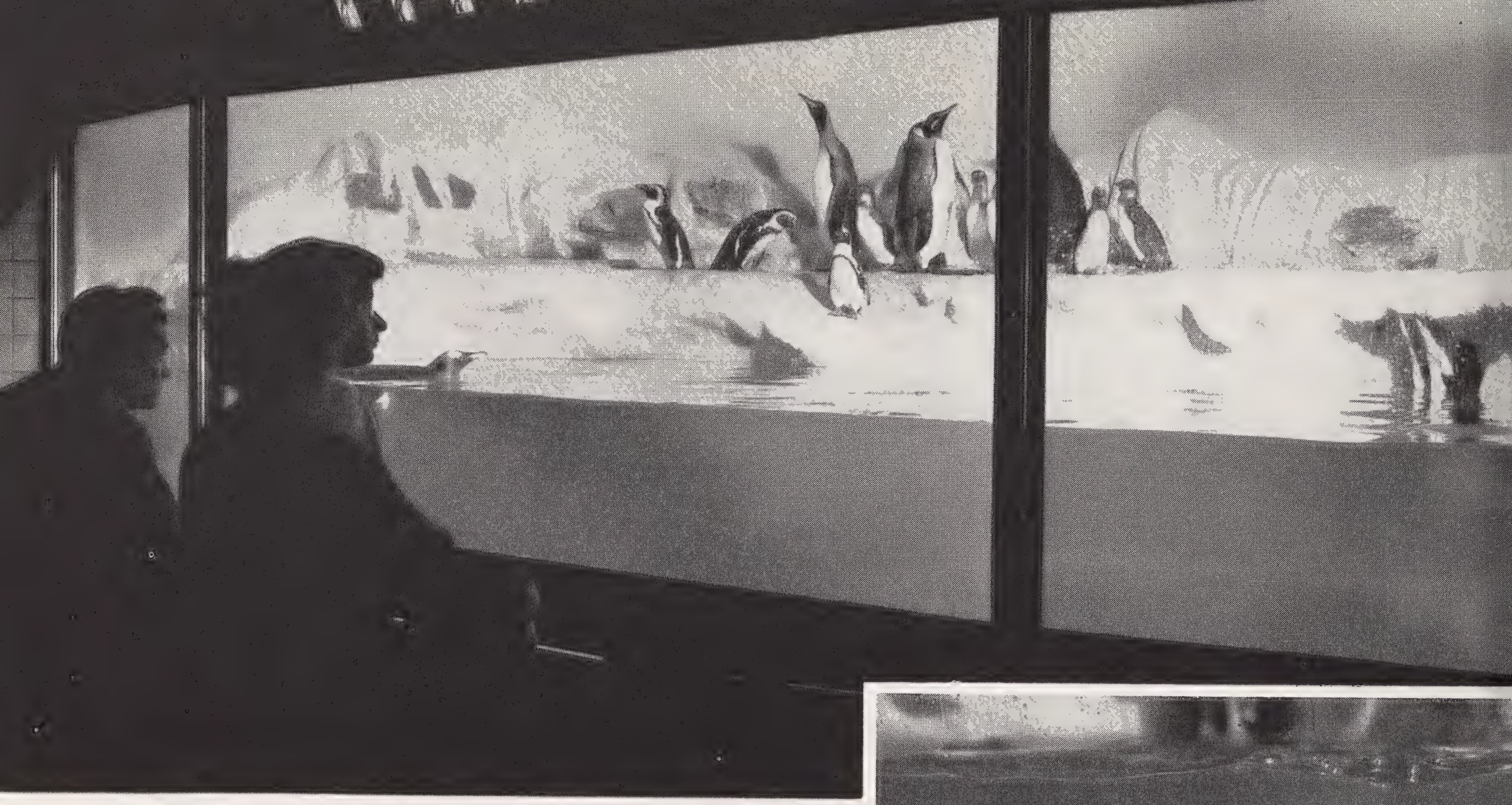
More experimental importations were made but it was not until 1915 that a pair of Black-foots became so nearly acclimatized that they reared the first young penguin to be bred in North America. That event, however, was by no means the end of our penguin difficulties.

Failures and half successes followed until 1941, when an apparently final solution of the Black-foot problem developed. In that year, a number of vigorous young Black-foots came to us from South Africa.

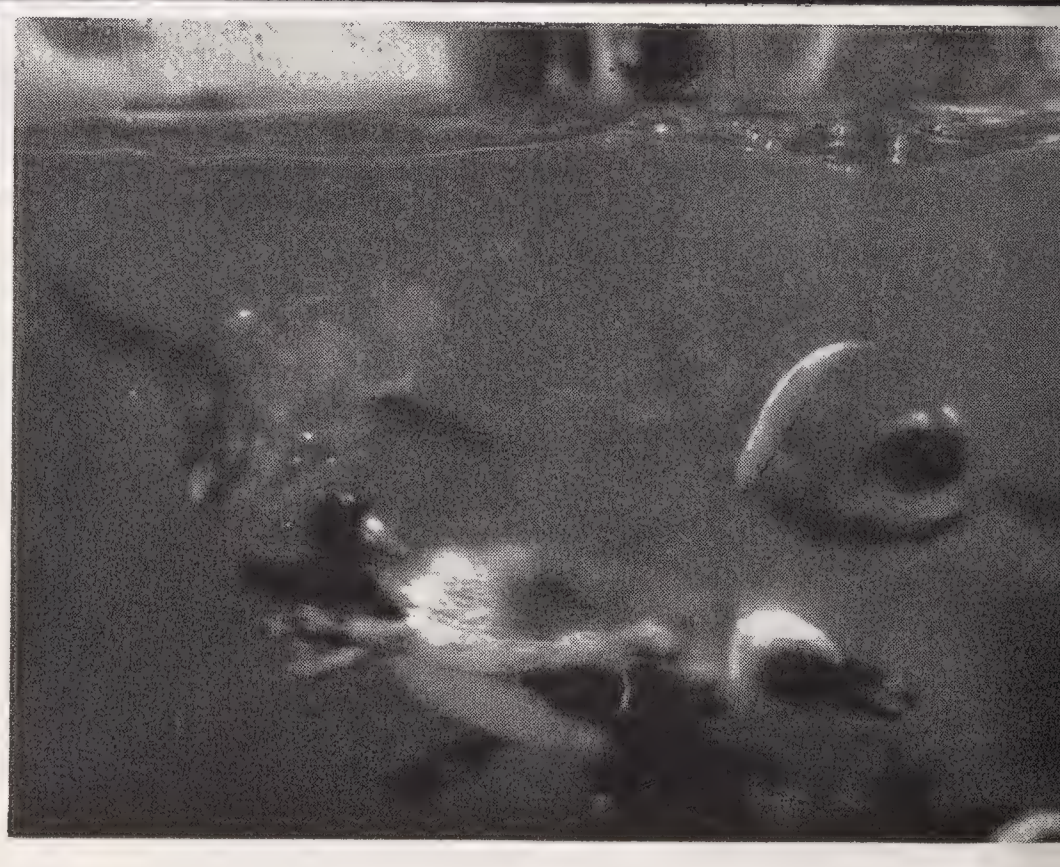
At the same time, the now famous "Annie" and his Humboldt's Penguin mate were transferred to the Zoological Park from the Aquarium, where they had been exhibited for several years. "Annie" confirmed the suspicion that he had been misnamed by promptly taking his mate to nest. This action must have acted as a "releaser," to use an expression of the behaviorists, for pairs of Black-



President Fairfield Osborn and "Jimmy," an eager little tropical American Kinkajou, together clipped the ribbon and opened the Zoological Park's new Penguin House on June 15. Jimmy has been the official ribbon-cutter for new buildings in the Zoo since he opened the Small Mammal House with great acclaim on our Member's Day in 1947.



This is the way visitors see our penguin collection in its new home. The public space is dimly lighted, in contrast to the fluorescent-lighted compartment for the birds, and the triple-glass panes are free of moisture.



foots promptly followed suit. Since then, twenty-two young Penguins have been reared and the colony has become so resistant that no case of aspergillosis has developed in it during recent years.

While the future of the Black-foot X Humboldt group of penguins in the Zoological Park now seems well assured, the status of those species that live deeper in the antarctic regions has presented a much more difficult problem. Our experiences with the superb King Penguin began in 1926. In that year, four birds were brought from Antarctica by the late Ellis Joseph. The first to reach America alive, these birds thrived during the cool weather of early spring but succumbed, after a few months, to the intense heat of summer. The effects of this depressing result endured until 1947, when we decided to make further efforts to exhibit one of the world's most intriguing birds. In the spring of that year, four Kings brought from South Georgia Island in the South Atlantic, were placed in a shaded section of the Penguin Pool and the water was cooled by floating cakes of ice. The result was the same as that of twenty years before: the birds could not survive high New York City summer temperatures.

Obviously, this left us with two alternatives: we could give up the idea of exhibiting King Penguins or we could provide air-cooled quarters for the summer months. We chose the latter course and early in 1948 began construction of a glorified butchers' cooler, on an experimental basis. The insulated aluminum structure was placed in the Aquatic Bird House extension, out of public access, so that we could be free to operate without regard to appearances. The apparatus was complete by May and two King Penguins that had been obtained in October of 1947 and had wintered well in the outdoor pool, were transferred to it.

Through two summers, our "cooler" proved completely successful and the information gained through its use was incorporated in our new building. In planning the latter, it was thought,

at first, that a section of an existing building might be utilized. However, we later realized that a separate structure, devoted entirely to a penguin exhibit, could become an important addition to our exhibitional units.

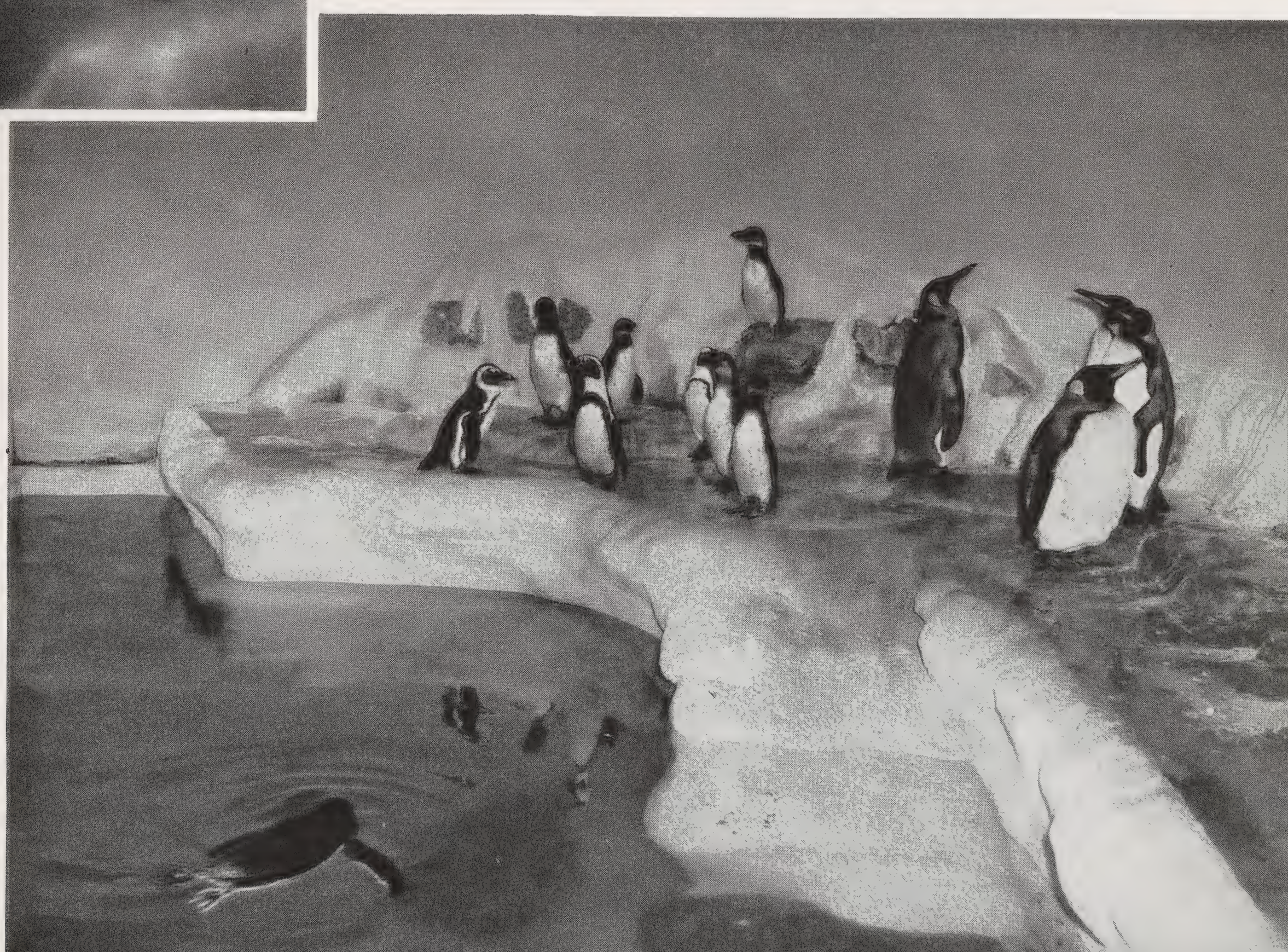
The building, located between the Reptile House and the Bear Dens, was designed by Aymar Embury and erected by the Bertoldi-Kelter Company. The total costs, amounting to some $75,000, were paid by the Society from Facilities revenue. Over all, the house measures 45 ft. long by 33 ft. deep. It is divided longitudinally into a two-level public space and a glass-fronted exhibition area. A 24 ft. pool extends along the glass, so that the birds are visible both on and under the water, as well as on the elevated area at the rear. Water pressure is restrained by heavy plate glass inside and condensation from the warm air of the public space is avoided by the use of double-layered, sealed glass on the visitors' side.

The interior of the exhibition area, designed and executed by Albert Wein, the sculptor, represents a bank of polar ice and snow. The water, cleared and purified by an elaborate filtering system, is constantly recirculated. Temperature is maintained at approximately 55° by a cooling system which uses its own water tower. Cool air enters the area through two specially constructed



LEFT — Underwater gyrations of the birds and their astonishing speed and agility have fascinated visitors, who gain a completely new perspective on penguin capabilities.

The chilled interior of the penguin compartment, as seen from the doorway by which the keeper enters to feed the birds. At the right center is a ramp leading down into the water. Some penguins prefer to dive in.



filters, designed to remove bacteria and the spores of molds which might prove fatal if they reached the birds.

Late in May, four King Penguins were placed in these ideal surroundings, our original two having been augmented by a pair secured, in exchange, from the Zoological Gardens in Edinburgh, Scotland, famous for their long-continued success with these birds. In addition were a Gentoo, a bird ordinarily most difficult in captivity and, for variety, six youngsters from our Blackfoot X Humboldt colony, which had just learned to feed for themselves. The birds were obviously

Continued on Page 130

Protecting Penguins from Aspergillosis

By LEONARD J. GOSS

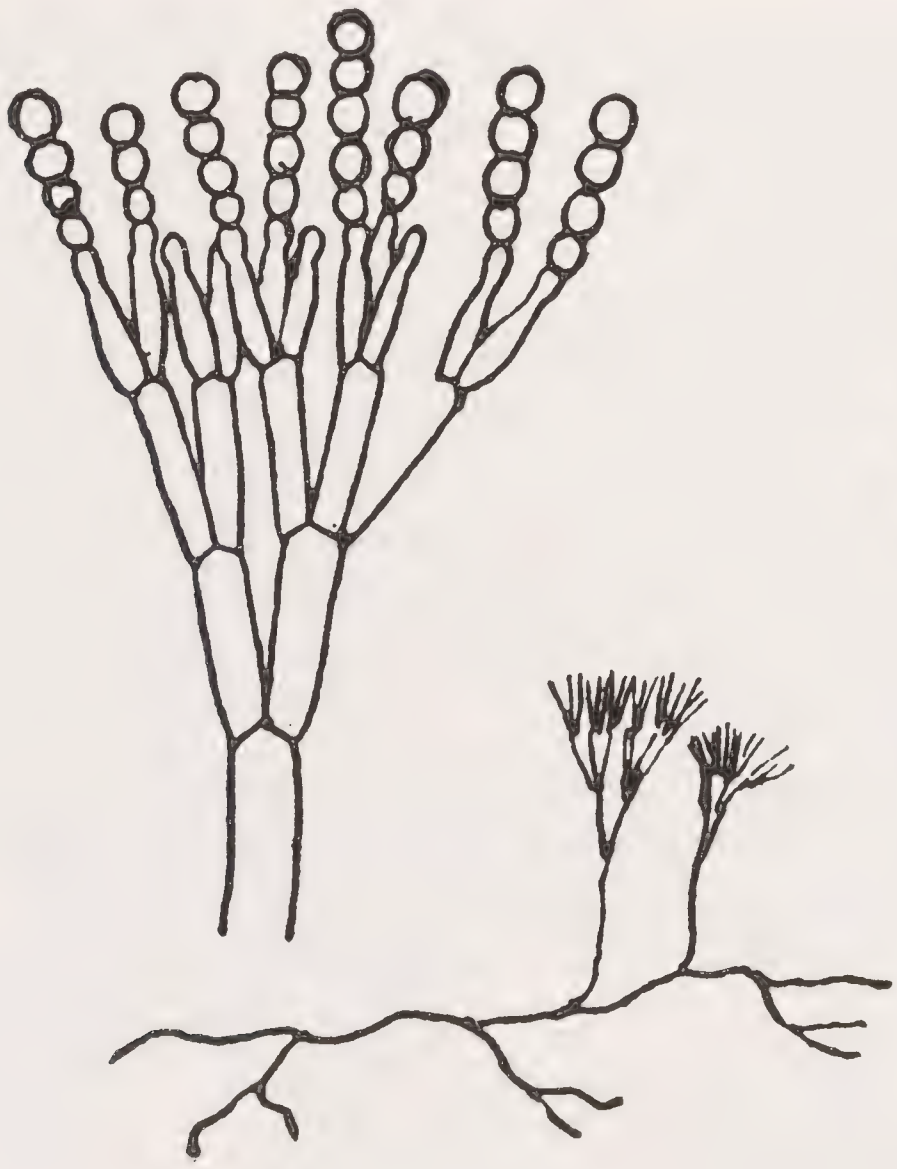
The air in our new Penguin House is probably the cleanest air in New York; in fact, there must be few areas in the whole world where the atmosphere is equally or more hygienic.

Are we pampering our penguins?

Well, yes and no. If you consider it "pampering" to try to keep them alive and to protect them from disease, yes, we are pampering them. We prefer to feel that it is just good animal management to take advantage of technical apparatus and knowledge that will keep our birds free from aspergillosis.

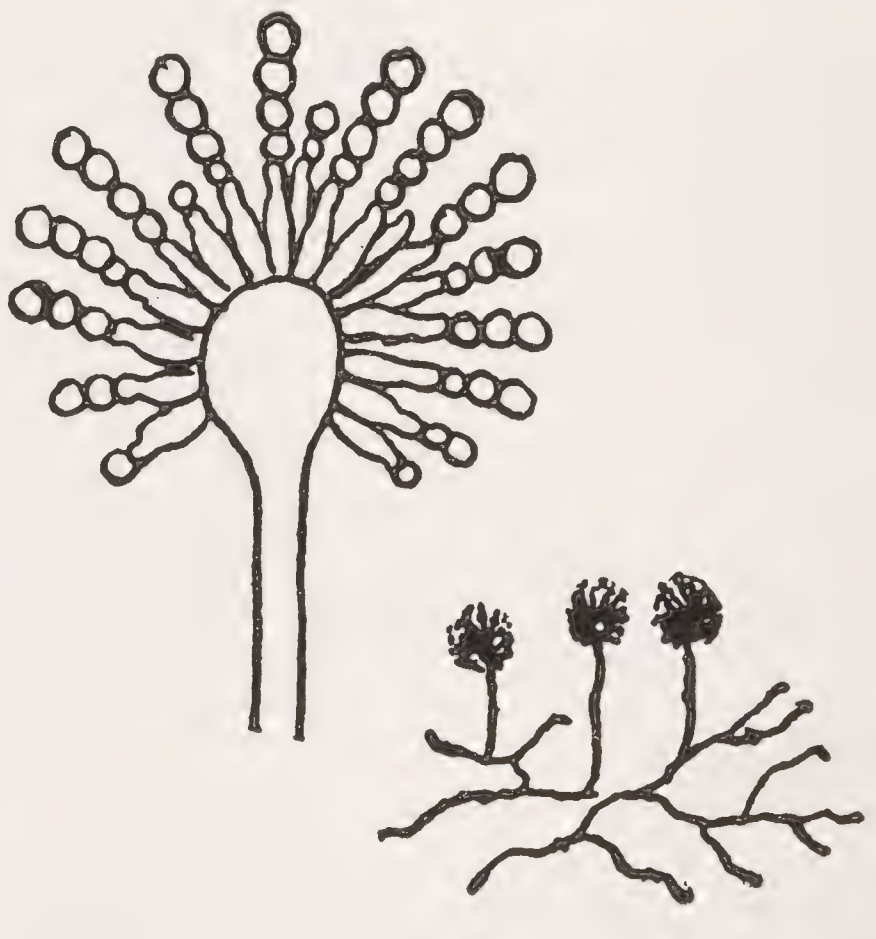
Aspergillosis is a respiratory disease and it is the greatest scourge of penguins in temperate climates. It is a mold disease of the lungs and air sacs and it is invariably fatal. So common is it among penguins that it is often referred to as "Penguin Disease." Epidemics occur frequently and can wipe out a whole collection of penguins. Other birds are subject to it, to a lesser degree; so, occasionally, is man.

Aspergillus mold reproduces itself by means of minute spores which are carried by the air from moldy food or bedding in the penguins' quarters. Up to now, we know of no treatment and the extremely hardy spores can be killed only by steam sterilization. Experimental work in our Labora-



From "Manual of Plant Diseases" by F. D. Heald

HARMFUL: Aspergillus mold, the killer of penguins, is like this.



From "Manual of Plant Diseases" by F. D. Heald

BENEFICIAL: Penicillium mold from which penicillin is made.

The illustrations above were accidentally transposed. The drawing on the right is Aspergillus mold; the one on the left is Penicillium.

tory demonstrated that aspergillus mold actually throve in test tubes submerged in chemicals that killed other molds.

Since there is no way of curing an infected penguin, the obvious indicated procedure is to prevent infection by filtering the air and making sure that no spores of Aspergillus mold reach the penguins. This required a special filter.

There is, of course, a filter for coarse particles in the air-conditioning unit which maintains the penguin enclosure at an even, low temperature, and it is perfectly adequate to take out dust, dirt and soot. Aspergillus spores, however, might easily sift through such a coarse screen, for they are only 2.5 to 6 microns in diameter. (A micron is 1/25,000th of an inch; a human hair is 1/200th to 1/1,000th of an inch thick).

Our special filters will stop anything larger than ¼ micron – in other words, larger than 1/100,000th of an inch. These filters are made especially for laboratories that require sterile, dust-free and even bacteria-free air. One interesting application of them is in certain laboratories of the Atomic Energy Commission where they filter the smoke from incinerators destroying radio-active material. Eventually the filters themselves become loaded with radio-active particles and have to be destroyed. Since there is no filter-to-filter-the-filters, the AEC simply buries its old filters in concrete vaults. We expect to be able to dispose of our Penguin House filters much more easily, simply by sterilizing them and throwing them away when they become clogged and therefore useless.

News from the Conservation Foundation

The Basic Ground Water Survey Is Completed

Completion of the Survey of Ground Water Resources of the United States in June is a milestone in the history of the Conservation Foundation, since this is the first research project of the organization to be finished and sent to press. During the spring of 1950 Dr. Harold Thomas of the U. S. Geological Survey, in charge of the work, has travelled far afield with his assistant, Stephen Bergen. Many weeks were consumed in preparing the final report for publication.

The McGraw-Hill Publishing Company will issue the survey in book form about the first of next year. News of the survey brought an urgent request for a draft of its findings from the President's Water Resources Policy Commission. A number of other agencies have expressed interest in the survey, among them such organizations as the National Security Resources Board and the U. S. Departments of the Interior and Agriculture.

One most encouraging outcome of this project has been the interest expressed by the National Association of Manufacturers. This association, composed of some 15,000 manufacturers, both large and small and of many industrial types, worked closely with Robert Snider, the Foundation's research chief, and with Dr. Thomas and Mr. Bergen in preparing a questionnaire on industrial water use which has been circulated to the association's entire membership.

Already, some two weeks after the issuance of the questionnaire, more than 2,500 replies have been received, together with requests for about a thousand additional forms, these coming from the larger companies with a number of plants throughout the country. Some N.A.M. members predict that replies will be received from as much as 60 per cent. of the total membership. The request for extra questionnaire forms is especially gratifying, as it indicates serious interest on the part of the bigger units in industry or of the larger water consumers in the United States. Some of these have asked for as many as 100 extra forms.

The information developing from this additional study is expected to be of great value. Data in the field of industrial water consumption have

been quite incomplete. Studies have been made of changes in municipal supply requirements for industrial use, but since there is a vast industrial consumption coming from private sources, the extant information is not at all conclusive.

To compile the results of this subsidiary survey it has been necessary for the Foundation and the National Association of Manufacturers to work with International Business Machines, Inc., in developing a code system for tabulating the returns. We will presumably employ the services of several experts to work up the eventual mass of material that is coming in.

This industrial survey, which has been developed with the help of both private and governmental consultants, deals with both consumption and pollution problems. Its results will eventually be published in some appropriate form, still to be determined.

With the completion of these two jobs in sight, Dr. Thomas has returned to his work in Washington with the Geological Survey.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

"RABBIT-SIZED" FAWN

Visitors who saw our four Chinese Water Deer fawns soon after their birth in June usually reported that they were "no bigger than rabbits," and the accompanying photograph shows that



Chinese Water Deer, Two Days Old

they were indeed scarcely larger than a Cottontail.

Being so tiny, the fawns had no trouble creeping through or under the fence about their big range in the northwest corner of the Zoological Park, and the lower part of the fence had to be entirely guarded with fine-mesh wire for a distance of several hundred yards.

Our Chinese Water Deer came from the Duke of Bedford's herd and arrived in December, 1946. They have the reputation of being delicate in captivity and are unusual in that two to seven young are born at a birth. Our original two pairs have never produced more than twins, but our herd is showing a small increase.

Nearly 200 Electric Eels Arrived Within Three Weeks

By C. W. COATES

As we have reported from time to time, the staff of the Aquarium and its associates are conducting considerable research involving the South American Electric Eel, *Electrophorus electricus*. The work requires a rather large number of these extraordinary creatures and since they have never been bred in captivity it has been necessary to arrange for continuing supplies from Brazil and adjacent areas, the only place in the world where they occur naturally.

There is no commercial fishery for Electric Eels, so the Aquarium has over the years worked out a collecting arrangement with Paramount

Aquarium, Inc., which has the fishing rights for Brazil. Its "Electric Eel Fishery" extends over an enormous section of the Amazon basin, from the island of Marajo in the Amazon estuary to Tabatinga, which is virtually in the Andes. The actual collectors of Electric Eels are Indians and their transportation equipment is of the most primitive kind — balsa wood rafts and dugout canoes. More modern methods take over after the eels are delivered to Paramount Aquarium's representatives up-river, however; the fishery operates a specially-built river boat 300 feet long with a draft of less than three feet, and this craft delivers the shipments of eels to an airplane large enough to carry several tons of water and fish from Brazil to New York.

The mechanical side of the operation has been relatively easy to organize, but it has not always been easy to pursuade, or teach, native collectors to capture such dangerous fish as Electric Eels. A native eel-fishery was operated on a minor scale during the war and produced a steady flow of eels for wartime research, but that collecting system was allowed to lapse at the end of the war. When research on the electrical, physiological and neurological properties of the Electric Eel surged ahead after the war, the native collecting system had to be revived and it has taken several years to get it into full production. For a long time we had to be content with two or three eels every three or four months, or else shipments of valueless baby eels. But now the fishery seems to be in its stride, and between June 13 and early July we received 195 good-sized Electric Eels, and have word from Para that more than a hundred of the creatures are on hand and will be shipped to the Aquarium by the first of August.

Dr. Gordon in Europe to Report on Pigmented Tumors

Dr. Myron Gordon, the Aquarium's geneticist, reported his work on pigmented tumors in fishes before various scientific groups in Europe this summer. In London he addressed the Royal Society of Medicine and from there flew to Istanbul at the invitation of the Zoological Institute of Istanbul to visit the laboratories of Dr. Curt Kosswig, a fish geneticist. At the end of July he was one of three speakers on melanomas before the Fifth International Cancer Congress in Paris and presented a paper on the inheritance of melanomas in fishes.

Record Longevity for a Bird of Paradise

On June 11 our Twelve-wired Bird of Paradise died at the very advanced age of 20 years, 10 months and 9 days. The best previous record for any Bird of Paradise was approximately 17 years for a Lesser in the Amsterdam Zoological Garden.



The longevity record for Birds of Paradise in captivity was established by this Twelve-wired which was in our collection from 1929 to 1950.

Our specimen revealed, on autopsy, a number of conditions associated with senility. The bird was in juvenile plumage when it was received on August 2, 1929.

A Rare Monkey Makes a Good Recovery

Wolf's Monkey from the Belgian Congo is a very rare animal in captivity and two specimens that Charles Cordier brought back last summer were probably the first ever exhibited in the United States. Consequently when one of them got into a fight with a cagemate on April 28 and suffered a bite-fractured leg, Dr. Goss made strenuous efforts to save the animal. Monkeys are by no means the most tractable animal patients, but sometimes splints can be devised that even a monkey cannot pull off. Our veterinarian devised such a splint for the Wolf's Monkey, with the result that two months and one day later, on June 29, it was returned to exhibition with the leg completely healed. The monkey seems to be as active as before the accident.



In appearance, at least, the Wolf's Monkey was most philosophical after his broken leg.

General Curator Crandall At European Meetings

General Curator Crandall attended a series of zoological meetings in Europe between May 31 and June 25. After the sessions of the International Union of Directors of Zoological Gardens in London, he visited Uppsala and took part in the meetings of the International Committee for Bird Protection and the Tenth International Ornithological Congress, later visiting the zoological gardens at Copenhagen and Paris.

A report on European Zoos by Mr. Crandall will be published in a subsequent issue of ANIMAL KINGDOM.

"Pete" the Hippopotamus Is Now Forty-seven Years Old

Once more we are privileged to record the birthday of Peter the Great (better known simply as "Pete"), our aged Hippopotamus. On July 13 Pete was forty-seven years old, having been born in the Central Park Menagerie in 1903. He came to the Zoological Park on July 14, 1906.

Summer Research Fellowships

For the fourth successive year a Summer Research Fellowship in Animal Behavior has been established in the Zoological Park, the incumbent being Joseph Murnin, a graduate student in experimental psychology at Pennsylvania State College. Mr. Murnin is continuing studies begun last summer on the visual acuity of various animals.

Dr. Dallas B. Tuthill, a graduate this spring of the New York State Veterinary College at Cornell University, has been appointed to a Summer Veterinary Research Fellowship, the second that has been granted.

The New Penguin House

Continued from Page 126

delighted with the conditions provided, taking to the water with unexpected spirit and abandon. The pool is so large that even the bulky Kings maneuvered easily, while the smaller birds dashed about with all the agility that penguins are known to possess but seldom exhibit visibly.

Two weeks later, when the doors of the new building were thrown open, the penguins were

well settled and completely at home. One of the Edinburgh Kings chose the moment for an inopportune molt, appearing to increase its girth to such an alarming extent that it had to be banished to the "cooler" until it had returned to normal. But all in all, if well-being of the birds and public acclaim are proper criteria, our new exhibition building appears to be a complete success.

The Duck-billed Platypus Can Climb, Too

By JOHN BLAIR
Keeper of the Platypuses

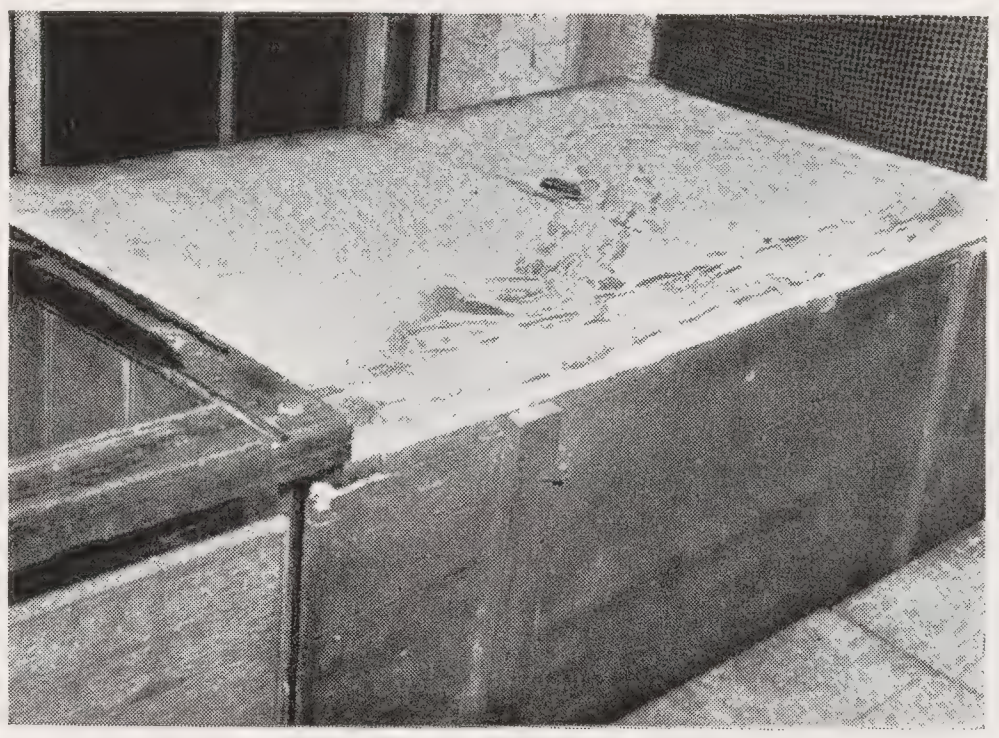
EARLY THIS SPRING, while our two Duck-billed Platypuses were still in their winter quarters in the basement of the Bird House, I noticed from time to time that tools, brooms, boots and other movable objects left overnight in the Winter Platypusary showed signs of disarray in the morning. Yet the enclosure was perfectly rat-tight and there was no opening that could admit an intruder.

A detailed examination of the burrow-box and swimming tank of the male, Cecil, revealed no possible means of escape. Turning to the female's quarters, I soon found that the box connecting Penelope's burrow and tank had rotted out. I replaced the floor of that box to allow her access to the tank. However this patch-work repair was insufficient and the nightly wanderings continued.

By sanding the floor and the top of her burrow-box, and by sitting motionless and silently outside the enclosure for long hours for several nights, I learned what an agile climber the Duck-billed Platypus really is.

Penelope would appear atop her burrow-box through the two-inch gap between the box and her swimming tank, then cautiously investigate her newly-found liberty. Finally finding her way to the only solid corner she worked her way down the wire screening corners before returning to the well-known safety of her burrow by reversing the route by which she had "escaped."

The most surprising detail, however, was to see her edge her way gingerly around the length and breadth of the three-inch ledge of her swimming tank, gripping the boards to maintain her equilibrium. The first time I witnessed that little antic, I broke into a cold sweat, for a fall of almost four feet to the concrete floor would certainly have been fatal and any slight noise or motion might have startled her into a possible fall. However, I



Penelope made these tracks at night.

interpreted it as just another bit of investigating and waited and watched. Always she made her investigatory trips safely.

Now we are wondering if we should not allow more freedom to the Platypuses, under controlled conditions of course, with a view to an attempt to breed these strange creatures in the United States.

Much observation is still needed, but the end should justify the means. A recent letter from David Fleay, who brought the Platypuses to us in 1947, said there are but four Platypuses in captivity in Australia at present and our Cecil and Penelope are still the only ones outside.

PUBLICATIONS OF INTEREST

THE STORY OF ANIMAL LIFE. By Maurice Burton, Deputy Keeper, Department of Zoology, British Museum (Natural History), with contributions by various other zoologists. 2 vols., pp. i-xii, 1-381; and i-vii, 1-423, 1,200 illustrations from photographs, some in color. Elsevier Publishing Company, Ltd., London, 1949.

To undertake an account of the animal kingdom, from Protozoa to Primates, is a formidable project. In its completion, Dr. Burton has achieved a success of real magnitude.

The first 134 pages of Vol. I are devoted to prepara-

tory subjects under chapter heads relating to various phases of life: origin, mechanism, history, expression, background and "cradle." These are especially well done, many by specialists, so that the reader is fully prepared to make the most of the systematic material that completes this and the second volume. Treatment, in general, is of a popular nature, although technical names are used where required and there is no glossing over of factual matters.

The illustrations are well selected and pleasingly numerous, a matter of great importance in a work of such scope. Moreover, they are largely of recent origin, giving the volumes welcome escape from the risk of slight mustiness which too often threatens general zoological publications.

It probably would be impossible for any author or group to complete a work of this breadth entirely free of statements open to argument and objection. Therefore, it is with some diffidence that this reviewer points out an assertion on page 187 of Vol. II to the effect that Hummingbirds "are found only in South and Central America and the West Indies, although they migrate northwards as far as Canada." Also, a curious confusion, on page 116 of the same volume, concerning the non-existent egg-carrying pouch of the Platypus.

Such complaints, of course, are of a trivial nature. These volumes over all are an important contribution to the popularization of zoology and as such will be generally welcomed. — L.S.C.

THE SANDHILL CRANES. By Lawrence H. Walkinshaw. x, 1-202. 18 plates from photographs, 1 in color. Bulletin No. 29, Cranbrook Institute of Science, Bloomfield Hills, Michigan.

Fifteen years in time, "some seventy thousand miles of travel," intensive search of the literature and consultation with an impressive list of authorities, have produced an account of the Sandhill Cranes that leaves little to be desired. The four forms of Sandhills — the Lesser, the Greater, the Florida and the Cuban — extend, successively, from Alaska to Cuba and the Isle of Pines. Dr. Walkinshaw has seen, studied and photographed them all in their native haunts.

The subject has been covered in the most comprehensive manner, as the chapter heads suggest: Molts and Plumages, Voice, Crane Behavior, Food and Feeding Habits, Pairing and Territory, Nesting, The Young, The Crane from Fall to Spring and History of North American Crane Populations. The general work is followed by a twelve page list of literature cited, a key to the cranes of the world, a voluminous compendium of distribution records and an extensive index.

This is a timely book, one that may well influence the continuance of the smaller of America's cranes. The Sandhills, at the moment, seem to be holding their own as well as continuous increase of human population will permit. It is perfectly possible that a similar study of the great Whooping Crane, made before it was too late, might have saved that noble bird from its present perilous condition. — Lee S. Crandall.

New Members of the New York Zoological Society

(Between May 1 and June 30)

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Henry Ittleson, Jr.
Randolph G. Pack
Mrs. Henry S. Redmond

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Mrs. Robert Wolf

We hate to bring it up,

but—

when are you coming back to town?

WE WANT TO MAKE SURE you get certain communications from your Society this fall and so we're starting right now, in mid-vacation time, to remind you to let us know when you change your address from summer to winter residence.

A little later there'll be an announcement of the opening of the new Great Apes House. That's an event you *mustn't* miss. Furthermore, we expect a full-dress report on Charles Cordier's Ecuadorean Expedition, with pictures of many great rarities, in the September-October issue of ANIMAL KINGDOM. We want you to be sure to get that issue.

So, just as soon as you know when you are leaving the mountains, the seashore, the country, or wherever you are for the summer, won't you please drop us a postcard? Just write your name, your after-vacation address, and the date when you'll be there, and send it to:

MEMBERSHIP DEPARTMENT,
The New York Zoological Society,
The Zoological Park,
New York 60, N. Y.


NEW YORK ZOOLOGICAL SOCIETY

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ANIMAL KINGDOM

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THE MAGAZINE OF THE NEW YORK ZOOLOGICAL SOCIETY

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Aspects of Present-Day Conservation. II.

Extracts from recent writings and addresses by
FAIRFIELD OSBORN, *the Society's President*

Of all the many resources upon which man depends, food and the food-bearing soils are the most important to his continued existence. An adequate supply, from the earliest times to the present day, has always been his greatest preoccupation. In this search, how many peoples in how many wars, hegiras and migrations, have coursed over the Earth's surface? Yet today the problem is still with us – and in an intensified form. For unless we can find a way to provide adequate subsistence to rapidly increasing populations, social and political advancement can never be attained. (*Role of Research in Conservation of Our Nutrition Resources*).

The tide of the earth's population is rising, the reservoir of the earth's living resources is falling. The cultivable areas of the earth, in relation to population, are now so limited that there are less than 2 acres available per person. Regardless of how food experts may differ on man's needs, this will not be enough to feed more people, pressing for higher living standards, if we continue our reckless practices. (*Address: Herald Tribune Forum*).

Dependence on the processes of nature does not, in any sense, exclude science and its vast benefits. Science can aid and abet natural processes, but it cannot replace them. The scientist's hybrid corn must sprout, root and grow by benefit of light, air, moisture and food. We can substitute artificial insemination for the bull, but the cow must still bear the calf. (*Address*: 14*th Educational Conference*).

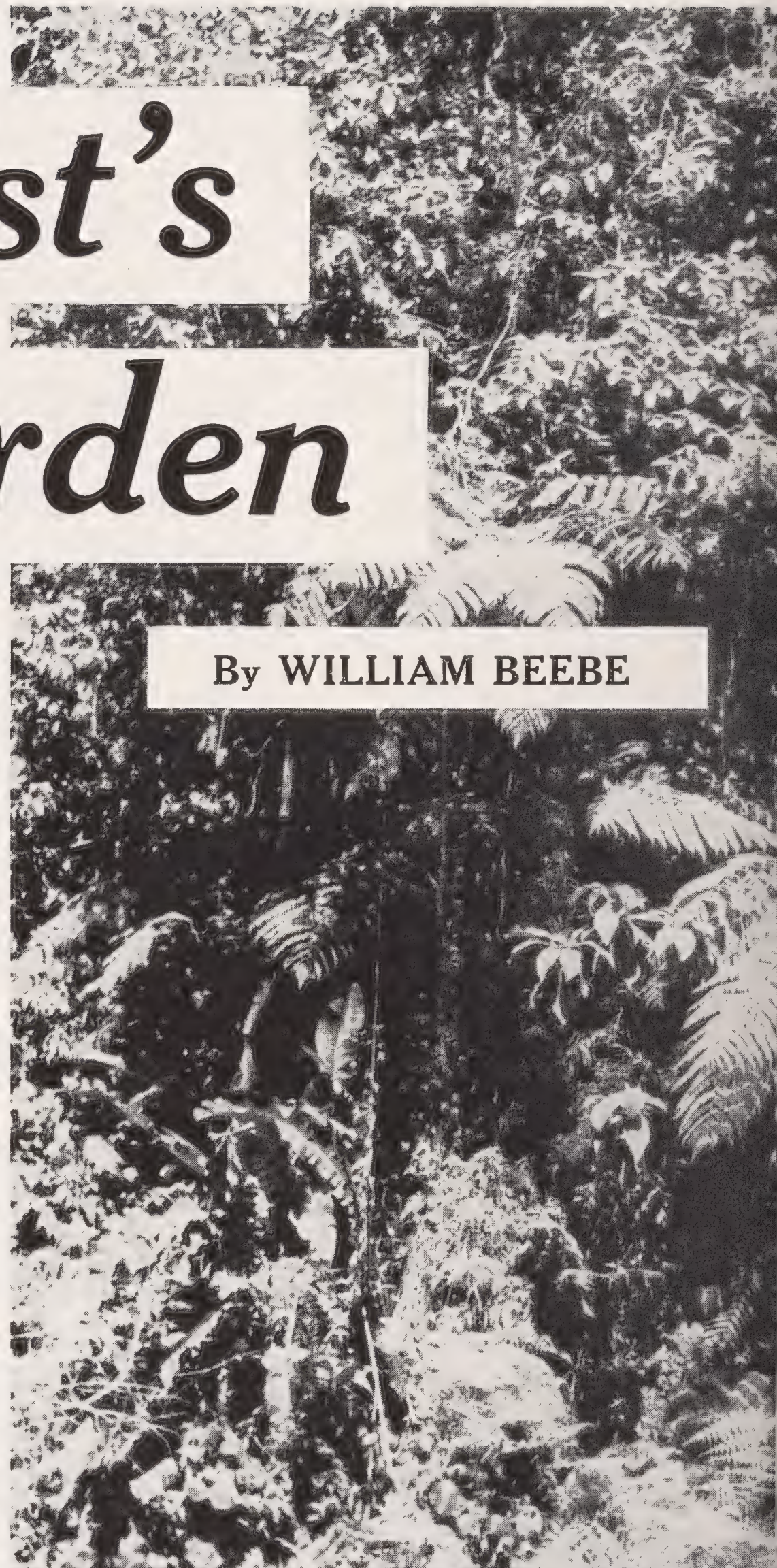
. . . resources are merely the agents or media by which human society may reach social and ethical maturity. The political climate of a country, a continent or of our world as a whole, is dependent primarily upon our discovering processes that lead to a balanced relationship between human demands and the earth's productivity. (*World Resources Situation – United Nations Scientific Conference on Conservation and Utilization of Resources*).

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OCT 17 1950

Zoologist's Garden



By WILLIAM BEEBE

This is another of Dr. Beebe's "newsletters" from the new Laboratory of the Department of Tropical research at "Simla," in Trinidad.—Editor.

THE GARDEN in all directions from Simla forces itself on our attention. The light on my table becomes diluted and I look up to see a delicate vine with orchid-like blossoms filigreeing the wire screening. The tempo of growth seems several times speedier here than in the north. A handful of jungle soil and a trowel of manure, and seeds and cuttings fairly leap into life. They even plant themselves. A lovely aristolochia vine from a seed dropped by some passing tanager has coiled all about a small palm. Setting out plants of Buddleia, butterflies gather and jostle one another at its blossoms before the roots are in the ground.

I seem to bear heavily on the botanical side, but if your laboratory is practically in the tree-tops, and a spectrum of blossoms — trees, shrubs, vines, orchids, lilies — impinges on the eye in every direction, only color-blindness could account for inattention.

Watson Webb's shortwave lamp is doing a beautiful job as a source of ultraviolet which is much more dependable than the temperamental tropical sun. Night or day, rain or shine, it glows steadily in the darkroom, illuminating butterfly wings, beetles, orchids and assorted strange blossoms. Their shortwave reflections can in this way be separated from the humanly visible components of their colors, and photographed for study and comparison. We are finding that butterfly markings which appear to us a deep, rich red are



presumably seen by their own companions as the purest ultraviolet. An orchid that is down-right purple to a mere human being, seems to be perceived by a visiting butterfly as a quite unimaginable ultravioletish yellow.

The core of our laboratory compound studies is the Ordway Insect House. It is all wire mesh, twelve by eighteen by nine feet, in the shelter of the grove of mahogany trees, and is furnished with gauges and meteorological instruments, as well as orchids, lantana, passion flowers and air-plants beloved by butterflies. When Jocelyn Crane goes in with a breakfast of fresh lantana, a cloud of melpomenes flutters toward her and covers the blooms with a maze of waving black and scarlet wings. Every particle of fear passes with the first day or two, and we can watch flower discrimination, as well as proboscis action and egg-laying with a hand lens. Serious study this season will be confined to this heliconid species; its senses, releasing mechanisms, its limits of instinct. For contrast the great cage is inhabited by blue morphos, skeleton butterflies, tapestry beetles and giant, scarlet-winged grasshoppers. Provide a generous enclosure, companions, appropriate flowers and brood plants and a butterfly's happiness and content with life are complete.

Another insect study which occupies many odd hours is what might be called an investigation of the Realm of Small. I have long wanted to get

LEFT—Almost at the door of our Tropical Research Laboratory is the great national forest of Trinidad.

BELOW—Cradled among jungle-clad hills of the northern range, "Simla" is naturally garden-girt.





A "captive garden" in the small, screened hut known as the Ordway Insect House brought the jungle closer, permitting intimate study of insect behavior patterns.

A Mango Hummingbird nested in a Flamboyant tree just outside the laboratory and it was possible to watch all stages in nesting and rearing the young.



away from the pseudo-majesty of man's six feet of height. What I have found by demeaning myself to ant height (and a very small ant at that) is an unexpected blow to human conceit. Protective and warning coloration, mimicry, elaborate adaptive characters and delicate releasing mechanisms are in active operation in beings from one to four millimeters in length, exactly as they are in man's coarse visual world. In this lesser cosmos a beetle one-quarter inch in length is a giant.

A search-light and a vertical sheet are dismaying to our time and ability in the wealth of strange creatures which are drawn to it each evening: primitives, such as earwigs and embiids, mothlets with wings split into a dozen separate feathers, others with splashes of golden gobbets; many wholly without names, most with unknown life histories.

As we studied the home life of the bat falcons of Rancho Grande, so here, by raising my eyes at my table, I can see the nest of a mango hummingbird. From the initial laying of the first strand of cobweb foundation to the flight of the twins, their lives have been an open book. At this moment, as I watch, the mother hummingbird returns and perches on the rim of the empty nest. Is another brood imminent? After weeks of laying, brooding, feeding and worry she has not a single disarranged feather. What a gal!

We have made five exploratory trips: first, to the Guacharo Cave on Dr. Wright's estate.

Henry Fleming led an all-day trip to the Oropouche Caves where some two hundred guacharos were found and underground catfish up to twelve inches, besides other organisms. Another all day trek, a hard tramp, was to the summit of El Cerro del Aripo, three thousand and eighty-five feet. Here was new and characteristic vegetation, with ground orchids and so-called mountain mangroves, altogether different from our familiar surroundings.

Another day we motored twenty miles to the north shore, up our valley and on to Blanchisseuse, over an excellent asphalt road as twisting

as an eel. Beyond the pass we entered a great area of government preserved forest, tumbled mountains and jungle-clad valleys with tall tree-ferns and rushing streams. The little coastal village proved to be unexpectedly clean and picturesque, dotted with coconut palms and fronted by many lovely tropical bays, with white sand and outjutting rocky headlands. Lines of great white breakers had no undertow, and were flown over by frigatebirds and wavering lines of pelicans.

Laura Schlageter took two weeks off and made a scouting trip, flying over and around Angel Falls, the highest in the world, far in the hinterland of Venezuela. The plane continued to a newly made landing strip, and camp was set up on a gigantic flat-topped mesa, inhabited only by a small tribe of primitive Indians complete with breech clouts and blow-guns. From Simla to the massif of Tramantepui is only five flying hours, which adds another to the variety of Simla's suburban terrain.

The most important item in this month's report is the inception and completion of the purchase of a magnificent extent of mountain ranges close to, and bounding the horizon of Simla to the south and west. This is known as the St. Patrick Estate (with alternative older names of Vanbrugh Park and Anatole!)

This was the property of the late Sir Norman Lamont with whom we formed a close friendship last year. His almost perfect collection of Trinidad butterflies and moths, formed over an extent of forty years, and this very estate were placed at our disposal to use in our researches. Late last year on one of his estates in the south of the island, he was attacked by one of his prize bulls and badly gored. As he was eighty-three years of age, there was no chance of recovery. When the conditions of his will became known I made an offer for St. Patrick which was accepted, and the purchase was consummated on May eighteenth, when I paid down ten per cent. of the price. Part of the ranges included can be seen in the background of the illustrations on pages 141 and 142 of my article on Simla in ANIMAL KINGDOM for September-October, 1949. Sharing in this venture are our very close friends, Mr. and Mrs. Frank Storms, fellow members of our Zoological Society, who are remodeling the charming house near the entrance of the estate.

The property consists of one hundred and seventy-six acres and includes a stretch of the Arima River itself, with a dam and a bathing pool. It extends up a wide valley and on up to the crests of two ranges. It is bounded principally by government preserved forest. Near the road at the southern end are two of the most enormous, orchid-hung saman trees I have ever seen. There are some twelve thousand bearing cocoa trees besides hundreds of citrus, tonka beans, nutmeg and plantings of teak, all of which will be worked by Dr. Wright on a fifty-fifty profit basis. Most of the land is untouched jungle and with government reservations affords primeval conditions for study and collecting. If I had not taken it, I fear some lumber company would have bought it, for there are a great many uncut giant trees which



Students from the Imperial College of Tropical Agriculture visited the laboratory for an introductory seminar. More formal talks are planned for next year.



A little Tree Porcupine lived for a time in the laboratory and was an entertaining pet—except at night when it usually called with a "dying yowl like a back fence cat, plus a hopeless final sigh!"

are valuable as timber. The Zoological Society can now feel that in the two hundred acres of the two estates it has an unparallelled site and opportunities for whatever ecological studies we can undertake.

* * *

If rain were a subject of absorbing interest this brief and final report would be a best seller. Our rather unworthy silver lining of smug satisfaction is that this year we share the unusual vagaries of weather with many other parts of the world. All over Trinidad are land-slides and washouts, cattle and furniture floating down bridgeless rivers. Simla takes no harm and we adapt our trips to the intervals between storms.

The flooding washes out interesting terrestrial and burrowing creatures among which are young ferdelance and boa constrictor infants. Constant ant and termite flights attract frogs, lizards and birds even before the rain ceases. Judging by the inmates of the Ordway Insect House the heaviest downpours have no ill effect on the most delicate butterflies.

Dr. Schneirla [Dr. T. C. Schneirla, Curator of the Department of Animal Behavior at the American Museum of Natural History] arrived on May twenty-sixth and ever since has persisted in long climbs and treks, exhibiting amazing amphibious nonchalance of body and mind. He may arrive at the laboratory soaked, drenched, sodden; but in the depths of his haversack is a small, grimy vial containing a single, bloated, overgrown army ant. The rain is as though it never had been, for at the expense of innumerable bites and stings he

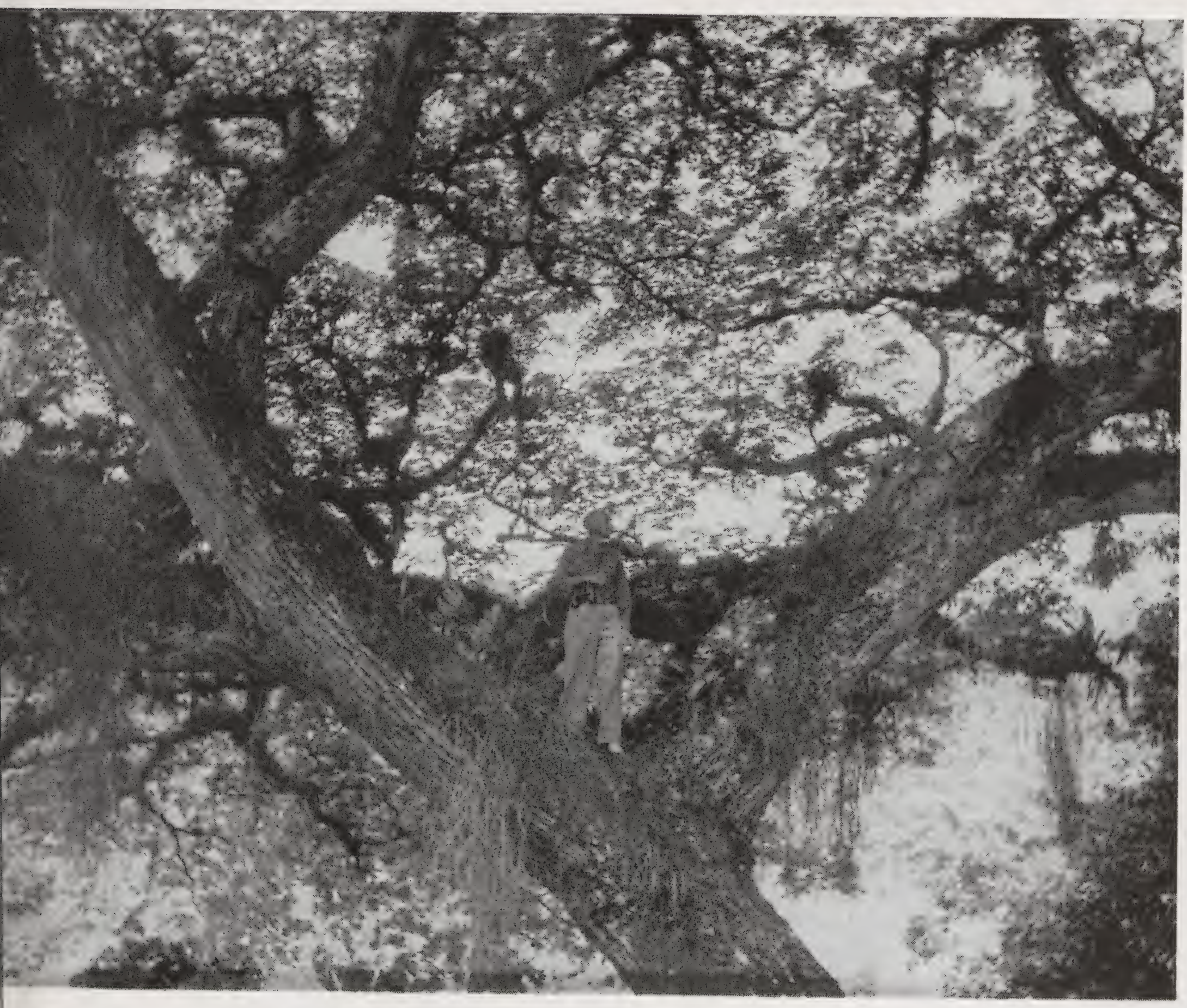
Saman trees are truly giants of the Trinidad forest and this one on the St. Patrick Estate near the laboratory was a garden in itself—a garden so richly hung with ferns, mosses, many kinds of epiphytes

has found and captured a group of royal attendants together with their physogastric Queen in her prime!

Under our lens she continues to lay egg after egg, each caught in the jaws of a faithful sterile lady-in-waiting. If we had time to watch or the conditions were perfect, the succession of eggs might reach the appalling number of twenty to twenty-five thousand. Ted Schneirla's success in establishing a good-sized nest of functioning army ants in complex artificial trays in the laboratory, foreshadows the certainty of similar, more extensive exhibits in a suitable Insect House in our Zoo.

On May twenty-seventh and again on the thirtieth, two groups of a dozen graduate biology students from the Imperial College came to Simla for an introductory seminar. Dr. Schneirla, Miss Crane and I gave short talks, and were asked about the possibility of a series of more formal lectures the coming year. They were keen, intelligent boys, coming from England, Scotland, Ceylon, India, China, Central Africa as well as British Guiana and Honduras and the Antilles. Most were majoring in Economic Zoology and Conservation.

Aside from the progress of our respective problems, which is hearteningly satisfactory but whose gradual increments would make dull reading, life at Simla is enlivened by unexpected happenings. One series was the combating of intelligent-seeming activities of plants. Here are two. Our favorite cyp tree, which overhangs the laboratory, carried an ever-increasing burden of mistletoe which was sucking its life sap. The berries are beloved of birds, who feed on them, transport them and unwittingly plant them high up in crevices of bark.



These great bunches of parasites must be removed, and we earnestly wished that Chiri, our tame Capuchin Monkey, could be trusted to do the job. But we knew all too well that in addition to impolite remarks and gestures in our direction he would only eat the berries and then proceed to defoliate the foliage of the cyp itself. As a substitute we hired Ram John, alias "The Boy," who swarmed up the trunk with fingers and toes, and with a twelve-foot cocoa-cutter amputated every morbid growth. A few days later the tree seemed to take a long breath and put out myriads of new leaves.

A second botanical threat was subterranean. An important pipe line became clogged and patient probing showed a wide extent of closely packed rootlets. A thirsty cedar tree many yards away had sent out scouting roots just below the surface, and when they were over the water-bearing pipe some vegetal divining instinct directed them downward. A tiny crack was sufficient to give admittance. The swelling, water-filled roots forced the crack wider and soon the whole diameter of the pipe was crammed with a maze of well-nourished rootlets.

Among the multitudes of insects which come to our electric-lighted sheet, strange, long-horned unbeetlelike beetles claim our interest for their evolutionary significance. One has two pairs of antennae — or at least in size, pattern, color and movement the hind legs imitate the real antennae, until any assaillant would be made dizzy trying to make out which end to attack. Another is so like a yellow-winged ichneumon fly that it was wrongly labelled and pinned in the wrong box; others have blazing fluorescent spots on the elytra. Finally a beetle appeared so like an ant that the ants themselves were fooled.

The Ordway Insect House is being shared with Dr. Simmons of the Imperial College of Tropical Agriculture who is introducing hesperid butterflies. These mate and lay eggs on suitable plants undisturbed by the parasitic wasps which cannot make their way in through the fine mesh. This is an extension of his studies of soil conservation and the control of insect pests, subjects of his teaching and experimentation.

St. Pat's Estate is so unlike Simla, although only two hundred feet lower on the valley floor, with somewhat different luxuriance and equally rich fauna, that I withhold any further comment until we have given it more study next year. I measured one of the two giant Saman trees near the entrance and found it eighteen feet around at man height, while the diagonal of land covered by the far-flung, outermost circle of branches is a full forty-five yards.

Less than three hundred feet from these trees we have found a five by five foot tunnel which has been driven deep into the side of the mountain, dug by gold prospectors when color was found years ago. No one knows how deep it goes. At present, at least near the entrance, it is occupied by hosts of bats, frogs and centipedes.

One bird note is the finding of a small assemblage of dancing gold-headed manakins which I located near one trail of St. Pat's, while Dr. Schneirla has just discovered, not far away, the amazing number of one hundred black-and-white manakins, occupying a dancing arena of less than a half acre.

My bedroom, at present, is no place for anyone suffering from insomnia, or restless from a bad conscience. At nine o'clock our captive owl begins his mournful call, and his cage mate, a tree porcupine, voices an antiphony, in part like the dying yowl of a back fence cat, plus a hopeless final sigh. A rat, intended for food of the boa, continues all night to leap noisily upon the head of his prospective executioner (as a matter of fact the rat never was harmed). Whenever I wake, the scraping of the snake's scales and the thuds of the bounding rat furnish the percussion part of the nocturnal orchestra. A pigmy owl beyond the terrace is cricket-like in its monotonous tomtom, metronome rhythm, and a poor-me-one in the middle distance seems stimulated by the lugubrious porcupine to emulous imitation of the wails of a lost soul.

Inside my room the ceiling is always cross-hatched by a half dozen fireflies — the luminous Morse code of the common ones and the twin headlight comets of big elaters. The air is frequently stirred by the swishes of a vampire quartering outside my net, until at five-fifteen the first Trinidad house wren begins to sing. All of these vocal and visual creatures disturb me less than will the automobile horns on a New York street.

This ends our first season at Simla. Future scientific results will prove its permanent worth.

BOX TORTOISE NURSERY IN A GARDEN PATH

About 8 o'clock on the evening of June 25, 1948, Staff Photographer Sam Dunton saw something moving among the stones of his Long Island garden path. It was a Box Tortoise, digging with its hind feet, and when the hole was so deep the tortoise's legs could reach no farther it deposited six leathery eggs and then refilled the cavity with earth. Its maternal duties at an end, the tortoise ambled away about 11 P.M.

As so often happens when an interesting natural history event occurs before one's eyes, Mr. Dunton's cameras were many miles away, in the Zoological Park. However, he marked the spot well and made a mental note to be present some months later when the young tortoises emerged. He *was* present—and these pictures are the result.

Preparing to open the cavity: the eggs are buried under a spot indicated by the trowel.









CENTER ROW

LEFT—The last of the 4 living tortoises freed itself from the shell at approximately 2 A.M. CENTER—Its eyes were closed as it made a final struggle out. RIGHT—It seemed to take tremendous effort for the little creature to break entirely free.



BOTTOM ROW

LEFT — This ventral view of the newly-hatched tortoise exposes the yolk sac still attached to the plastron. It supplies food. RIGHT—A hatchling and an adult Box Tortoise for a comparison of their sizes.



TOP ROW

LEFT—On Sept. 26 the nest was uncovered and here are four of the six eggs, with young tortoises beginning to make an exit. CENTER—These 2 eggs did not hatch, although development had gone far and the claw of a dead tortoise protrudes from a crack. RIGHT—On Oct. 4 the hatchlings were removed from the sandy cavity. Moisture had to be added because the air quickly hardened the shells.







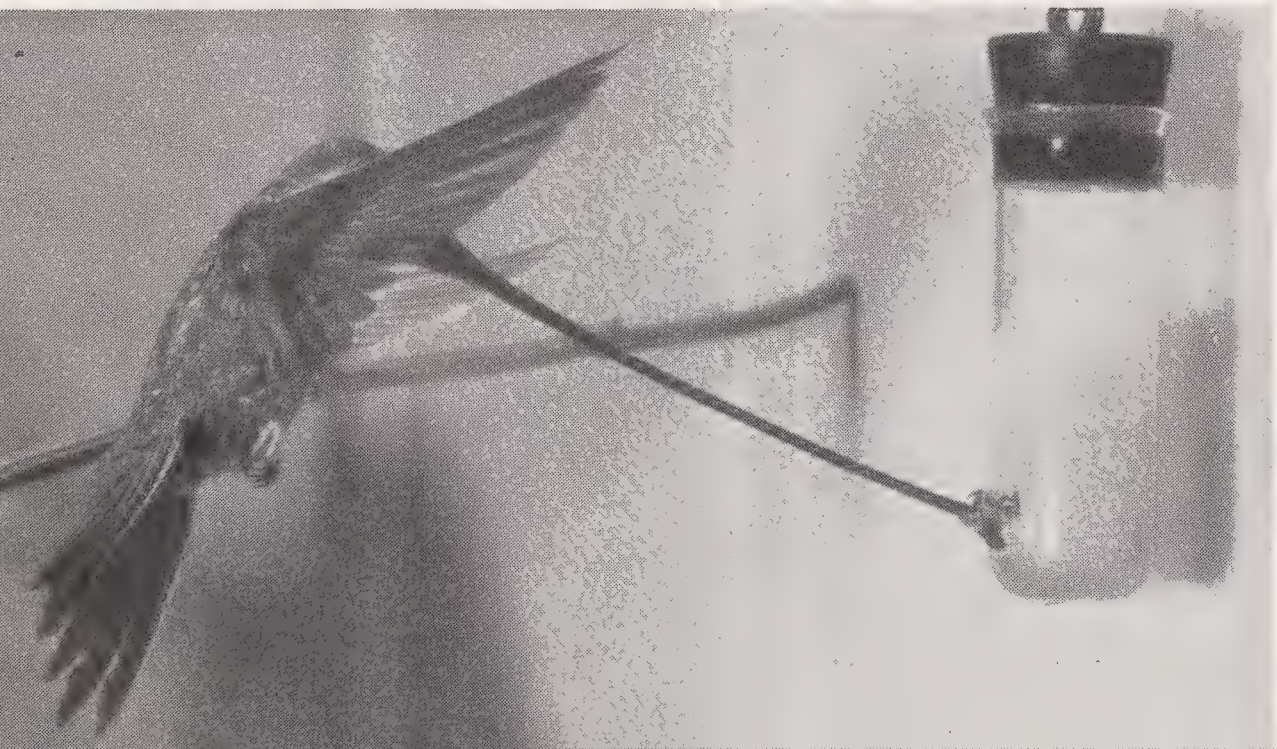
FEATHERED TREASURES FROM ECUADOR

Our Greatest South American Collection

By LEE S. CRANDALL







WHEN Charles and Emy Cordier left for Ecuador on October 2, 1949, plans for their winter of collecting in the high Andes and perhaps on the lower slopes, were reasonably definite. They would pilot their gear through Customs at the port of Guayaquil, proceed to the capital city of Quito (elevation 9,200 feet) and devote the winter to a series of local expeditions. With the coming of spring or early summer, they would return to us with Umbrella Birds, possibly of both South American forms, perhaps Cocks-of-the-Rock, certainly Hummingbirds and Tanagers. A perfectly simple project – on paper. It came out like that, too. We received a marvellous collection, listed below; the press was kind, crowds are still coming to view. But there was more in the doing than plans on paper, there is more about these birds and mammals than ever will appear in words. For when you work in the Andes and in the dank lowlands that lie beyond their eastern slopes, you deal with reality, not plans and words.

After the Cordiers had arrived in Quito, they established themselves in a vacant house with a walled garden. There was a smaller building, too, into which they later moved, using the larger structure to shelter the collections as they grew. Charles equipped himself with a pick-up truck, and loading it with camping and collecting

TOP—In this cold valley of Papallacta, 11,000 feet up the eastern slope of the Andes in Ecuador, the Sword-billed Hummingbird feeds on flowering trees, just to the left of the house. CENTER—These are the "Angel's Trumpet" blossoms (Datura sp.), yellow and brownish-red, six inches long, from which the hummingbird feeds. BOTTOM—And this is its way of drinking artificial nectar in the Zoo.



THE SWORD-BILLED HUMMINGBIRD



The Green-tailed Sylph is one of the most dazzling of all the new acquisitions; its tail is a shining, iridescent green-gold.



Next to the Sword-billed, the greatest rarity is Gould's Sickle-billed Hummingbird. The curve of its beak would indicate peculiar and specialized feeding habits; it feeds on flowers whose calyxes stand upright.

equipment, he and Emy set out down the Pacific slope almost due west of Quito. Camp was established at an elevation of about 2,500 feet and it was there that Charles netted his first male Long-wattled Umbrella Bird, as related in Animal Kingdom for January-February, 1950.

After an all-night drive, the prize was comfortably housed at the Quito headquarters. Leaving the bird in Emy's care, Charles left again for a spot still farther down the slope. Here he increased his bag of Umbrella Birds by two more males and a female. All four are now at home in the Bronx.

Having thus accomplished his Number One objective, Charles then set out to check off Number Two — the Eastern Umbrella Bird. Since this bird is known to inhabit the vast lowlands that flank the Andes at the east, this

undertaking was obviously a venture of some magnitude. Packing his gear in the pick-up and accompanied only by a native helper, Charles set forth northeastward to Shell-Mera, headquarters of the Shell Company of Ecuador, Ltd. Leaving the pick-up here in good hands, Charles proceeded by plane to the tiny airfield at Tena. Fourteen miles more by mule-train found him on the banks of the upper reaches of the Napo River, a tributary of the Amazon. From this point, in a native dugout, the explorer started down-river, in continuance of his quest. After days of hard labor and futile search for Umbrella Birds, Charles had the good fortune to be able to purchase an outboard motor from the obliging manager of an outlying Shell post. With this modern aid, movement was much facilitated and exploration of the numerous



Two immature Small-billed Thorn-bill Hummingbirds. This species is remarkable for having the shortest bill of all hummers—only four-tenths of an inch long. The bird itself is one of the smallest hummers.

The ribbony black tail and a flashing green-and-gold throat are characteristics of Boucard's Train-bearer. Its body is a metallic olive green, smooth and glistening.





LEFT—The Long-wattled Umbrella Bird from the western slope of the Andes is one of the great prizes of the Society's expedition. This is the first time it has ever been exhibited alive.

Equally rare is the Eastern Umbrella Bird, from the east slope of the Andes — another "first timer." It has a short wattle that is generally held close against the body, and is scarcely seen.



forested islands continued. It was on March 2 that the first Eastern Umbrella Bird – a female – fell into the nets. In a letter from Providencia, dated March 5, Charles related his experience with this bird:

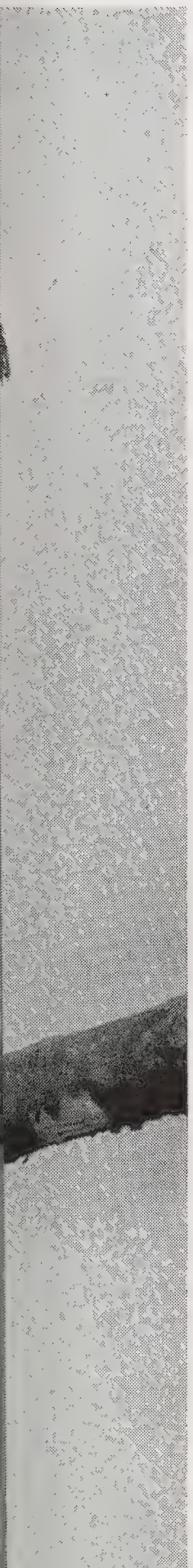
"There is quite a tale to this capture. Some days ago I received the linen thread from Augur you sent to Emy and I made up one fine large net, working like mad. The day it was ready I went over to the island to hang it up where everything had been left in readiness near the one and only fruit tree. Imagine my pleasure upon noticing that all the lines had been stolen. . . . We took the poles down, put up new lines – a matter of four men and one day– and set up the net. Then I went over to the oil camp a good mile downstream. Going and coming we had outboard motor trouble and it was 8 P.M.

before we managed to reach the nets again, thanks to bright moonlight. There was only an owl in one of the five. We were turning back when an Indian boy appeared to confide their neighbors had taken a *bogonero* (Umbrella Bird) from one of the nets. We hurried over and, sure enough, there was the female, mentioned above, in a basket. Expected to sell it to me later, no doubt."

On April 8, two males were added to the bag. The field mission completed, Charles took off down river to the military post at Tiputini, from which he expected to be flown back to Quito. Unfortunately, flooded conditions on the small airfield prohibited landing there and it was not until May 10 that, through the good offices of Mr. Werner Speck, Swiss Consul at Quito, in chartering a plane, Charles was safely returned to his base at Quito. His difficulties in keeping and feeding his precious birds and our own anxiety as to his safety during this trying period, will not soon be forgotten.







TOP — The Equatorial Cock-of-the-Rock, a form new to us, is colored tangerine, silvery and rich, velvety black.

CENTER—The Hooded Mountain Tanager is one of the largest of the Tanagers, and is a rare and colorful bird.

BOTTOM—This Turquoise Jay is probably the first one ever to be exhibited. Its plumage is in varying shades of blue.





The Comte de Paris' Star-frontlet does not belie its name, for it has a patch of iridescent, scale-like green in the center of its forehead.



The Western Buff-tailed Coronet shows the rich buff of its underwings only when it flies. It also has an iridescent area on its forehead.

Once recovered from this long and harrowing experience, Charles was quickly afield again. First, back down the eastern slope to 3,200 feet for the lovely orange-apricot Equatorial Cock-of-the-Rock. Then up to an elevation of 11,000 feet on the eastern rim above Quito for Hummingbirds and Tanagers, then again to 3,200 feet for more. Between and during each of these trips, Emy remained at her post in Quito, devotedly caring for the collection in hand and each time finding space for more. Without her, an accumulation of such magnitude would have been impossible.

As a prosaic outline of the operation of a collecting expedition, this account seems simple enough. The constant tests of skill and endurance, the days of waiting and watching, the innumerable observations of the ways and habits of little known creatures, must wait for a more detailed account by Charles Cordier himself.

When, on July 20, a special plane of the Area Company arrived at Idlewild Airport with Charles, Emy and their treasures abroad, the expectations of many months were realized. So

many rarities of the first order surely had never before come from South America.

The Long-wattled Umbrella Birds are the most spectacular with their immense breast pendants,



The big and spectacular Chimborazo Hill-Star comes from an altitude of about 14,000 feet. Its home is among rocks and cold rain and fog.

still of unknown function. The Eastern Umbrella Bird is quite different in appearance, its white eyes and strongly depressed crest distinguishing it completely from its relative. This bird, too, has a feathered wattle, but in repose holds it so closely to its breast that it is hardly discernible. One day we may hope to know more of this.

The Equatorial Cock-of-the-Rock is a lovely creature, a strong orange-apricot in color and larger than either of the two forms already in our collection (the Eastern and the Scarlet). The crest is comparatively small, sharply cut upward from the back and strongly bushy at the front.

(*Continued on Page* 161)



With a bill about an inch and three-quarters long, the Lance-bill feeds from deep-belled flowers. Its beak turns very slightly upward.



All photographs by the author.

At the age of 127 days this Brush-tailed Tuan, or Phascogale, is about half-grown and it is an exceedingly alert and active little animal.

Experiences With Australia's Brush-tailed Tuan

By DAVID FLEAY

A WHOLE GENERATION is growing up in Australia without first-hand knowledge of one of our handsomest small marsupials, the Tuan, or Brush-tailed Phascogale. Once it was common enough, but a pestilence of some sort swept across the land in 1898-1900 and since then this mighty little hunter of mice, birds and insects has been absent or exceedingly rare in many localities in southern Australia.

It fascinated me and in my University days I was generally known as "Phasca" Fleay because I was always talking about the phascogale and dashing off to remote corners of Victoria in quest of a pair for breeding purposes. It took some years of searching, but I did get a breeding pair in 1932 and the main object of this article is to give an account of the first recorded breeding of the animal in captivity.

First, however, I should say that the Tuan is known scientifically as *Phascogale tapoatafa;* phascogale means, literally, "pouched weasel." It is the largest of a number of species of phascogales, about the size of the brown wharf rat, and its most prominent feature is the thickly-haired, glossy black tail—a perfect bottle brush. The pelage is silver gray, soft and smooth. Before its numbers and range were reduced, it inhabited most of Australia except the extreme north, and it particularly favored open forest country. It is an active, restless, nocturnal creature, always scurrying up and down tree trunks, cork-screwing around the trunks, signalling its annoyance when disturbed by a tap-tapping of its foot on the bark.

Success in my quest for Tuans finally came in February of 1932 because of the persistence of Gavan Crowl and Miss Zwar of Broadford, Victoria, who kept box traps set in the open forest of their home district for months until they caught two immature females for me. The bait, incidentally, was an evil-smelling mixture of Rosella parrot and honey. Two months later a male was captured in the same locality and thus I had the makings of a complete family group.

As living quarters, we built a special cage fitted with steel-lace netting—and even the wooden sides of the cage were covered with sheets of galvanized iron, for once a Tuan makes up its mind to escape it takes more than wire netting and thick wood to deter him. A leaning, stringy-

bark log and a box 12 x 6 x 4 inches with a small entrance hole were provided, but, so shy were the captives that one never saw them moving about at night unless a flashlight was switched on from some distance away. A momentary glimpse of a gray shadow with bristling black tail was usually the most one could hope for.

The diet consisted of freshly killed mice and sparrows, and bread and milk flavored with melon jam or honey. Rodents such as mice and young rats are the favorite food of these flesh and insect hunters, and no cat ever pounced on a mouse with greater keenness and swiftness than does the Brush-tailed Phascogale. When it was given a freshly killed mouse, be it day or night, it would quickly scent the victim and dispose of it, commencing at the head end with a noisy accompaniment of "scrunching." Hair, bones and even the tail disappeared, leaving no trace. Birds were occasionally left uneaten except for the brain; this was usually the case with the somewhat distasteful starlings. A phascogale once escaped at Badger Creek and on one night of freedom killed three Rosella parrots and two Bronze-winged Pigeons, eating only the brains. It is interesting to note that unlike its smaller allies, the Yellow-footed and Swainson's Phascogales, the common Dasyure (or "Native Cat") and the Tasmanian Devil – all members of the family Dasyuridae – the Brush-tailed Phascogale appears to be strongly averse to carrion. It prefers to kill its own game and feast upon it at once.

After a month in their new home the Tuans settled down sufficiently to strip shreds of bark from the log and carry them into the box to form a comfortable nest. In home trees in the bush, bark appears to be the favorite material for nest-building. Occasionally parrots were fed to the marsupials and they were dragged into the nest and their feathers added to it. Concerning the nest-building habits of this species, there is a story of two timber cutters camping out in isolated back blocks, miles from another human being. They got along amicably enough until a one pound note disappeared, and then feelings were tense until the felling of a dry tree revealed the missing money neatly incorporated in a Tuan's home!

On May 18 it was seen that the pouch area of the smaller female had developed slightly. No



Typical of the Brush-tailed Tuan's habitat is this grove of Peppermint Eucalyptus. A Tuan makes its home in the hollow tree at the right.

longer was it distinguishable from the creamy white hair of the under surface only as a yellowish patch, for the growth of dull rufous-colored hairs gave the area a distinct tinge. This development corresponded in time with that of several native cats (*Dasyurus quoll*) in a neighbouring cage. It is typical of marsupials in general, particularly members of the carnivorous Dasyuridae, to be strictly seasonal in producing their midget young. In temperate regions this invariably occurs in the depth of winter.

The characteristic sweet honey-like odor, very similar to that of the pigmy glider, was noticeable when handling the Tuans.

By May 29 the larger female (with which we are concerned) also displayed a well-advanced stage in the seasonal pouch growth, and there was a distinct anterior ridge. Eight mammae were counted, and in fact, neither female possessed more than eight, although individuals



This photograph was taken the day the young Tuans were born, and soon after they had made their way into the pouch area. Their length, in curled position, was about 1/5 in.

may exhibit ten. It was considered unwise to worry the phascogales unduly at this stage, so for the greater part of June they were left strictly to themselves and were fed with studied care. Occasionally in daylight slow, prolonged hissing cries were uttered continuously for minutes at a time. Then, in the first week of July the larger female became the centre of keen interest, for attached in her now moist pouch area were three embryos no longer than a fifth of an inch (4-5 mm.) in their curled-up attitudes. The naked, flesh-colored mites showed fairly well-developed forelimbs, but otherwise were most immature, with blue pigment spots marking the position of the eyes.

The day of birth was apparently July 2. As five mammae were vacant, it is unfortunate that the mother had not been isolated previously. Evidently the other pink mites (usually there are more born than there are mammae to accommodate them) had been displaced or had fallen victims to the carnivorous tastes of the other adult animals. Bearing in mind past experience with smaller phascogales and with dasyures and their young, I removed the other inmates of the cage immediately. The smaller female may have produced embryos but none reached the pouch.

The problem of obtaining photographs was indeed a difficult one, for the Tuan was as wild and untamed as on the night when she was captured. To hold her securely for the briefest time in order to inspect the pouch was a worrying task. The muscular little animal was almost as "squirmy" as an eel, and there was danger of displacing the embryos or losing her by permitting her to jerk away suddenly. When she uttered her soft churring note of annoyance, it was advisable to see that no part of one's hand was in close proximity to the sharp teeth! However, by holding the animal myself and getting Mrs. Fleay to operate the camera, we were fortunate in securing several useful pictures. On account of the nervous temperament of the parent attempts at photography were not made until July 22 when the three infants were 20 days old and nearly three times their original size. The length of each one was now 9 mm.

On August 5, at the age of 35 days, the pink, grub-like babies were 12 mm. long, or half an inch. They now showed a good deal of movement and nearly filled the pouch area. Invariably when the mother was liberated after being handled, she made a lightning dash for the nest and we were in constant despair of the safety of the dangling babies. These fears proved to be more than mere imagination on August 16 when it was discovered that only two young phascogales remained; it was fairly certain that the mother had eaten the third.

However, on August 23, in spite of all, at 53 days, the young Tuans still existed. Dark pigment showed up the tips of the ears and the very faintest traces of fur had begun to clothe the bodies. It was seen that they were of opposite sexes. On September 1, at 62 days, there was a general thin coating of hair. They were equal in size, 60 mm. exclusive of the tail. The ears and the terminal halves of the tail were definitely

black. The eyes were still unopened on this date.

An important stage was reached on September 6 at 66 days, for now, after nine weeks of attachment to the mammae and of being dragged about and banged into obstacles, they were found for the first time lying quite free in the nest. The difficulties experienced by female phascogales in the wild (as I was able to determine later when captive animals reared full broods), carrying the normal eight young of this size and age, are a real hazard to the mother. From this time on the two young Tuans were able to fasten voluntarily to the mammae or release their hold at will. The mother generally emerged at night and left them in the nest while she sought food.

When first discovered apart from the parent, the young ones uttered faint "cha-cha!" cries. Although their eyes were still closed, their ears, eye regions and the terminal halves of the tails were conspicuously black against the faint gray tinge of the fur. On September 12, at 73 days, they were still more advanced, and the close-up photograph of the baby male (Page 156) gives a clear idea of the relatively large size of the head and the general development at this date.

When separated from the parent, the young phascogales crawled about blindly, uttering staccato "tchit-tchit!" noises, reminiscent of a small black cicada's summer song. If they were placed on the edge of the shredded bark nest, the mother immediately raked them beneath her with her forepaws, precisely as I had seen a female Dasyure do with her own young. The temperament of the female now altered considerably. The maternal instinct conquered her natural shyness to a considerable extent, causing her to respond impulsively to the babies' cries of helplessness and distress. In February 1934, even with the responsibility no longer present, the little animal was less wild than when her young were first born. She was furtive and retiring still, but quieter and more reconciled to the restricted life.

To return to September 12, it was found that when the mother raked the young ones beneath her they immediately fastened themselves to the mammae with a vise-like grip of the jaws and it was impossible to dislodge them without injury to the mammae. They would still hang there for hours at a stretch in spite of all the rough journeys on which the mother might drag them when disturbed from her nest. From the day of birth on July 2 the three mammae with young attached had gradually developed with them, but one had retrogressed with the loss of the third infant, and on September 12 the pouch consisted of two large mammary glands occupying the whole area. The remaining six, on close inspection, were only distinguishable as red pin points. In the case of a female killed by a car on the Western Highway at Gordon, Victoria, on November 27, 1933, all 8 mammae were at the stage of maximum development and the symmetrical arrangement, unlike that of many members of the American Didelphidae, showed four teats on each side of an antero-posterior median



At the end of 73 days the youngsters are showing a faint growth of fur and are no longer the grub-like mites they were at birth. Now they can free themselves from the teats.

line. They extended when pulled out to one inch and in repose were short and button like.

The two mammae in the pouch of the captive female were in a posterior position and their development had spoiled any chance of the normal regular arrangement.

On September 21, at the age of 82 days, the young animals were distinctly furred as far as the head and anterior regions of the body were concerned. However, their eyes were still closed, and although the posterior regions of the babies were still thinly haired, the tails were growing small black brushes. It was noticed that the male was a trifle smaller than the female, which corresponded to a similar stage in the development of young Dasyures.

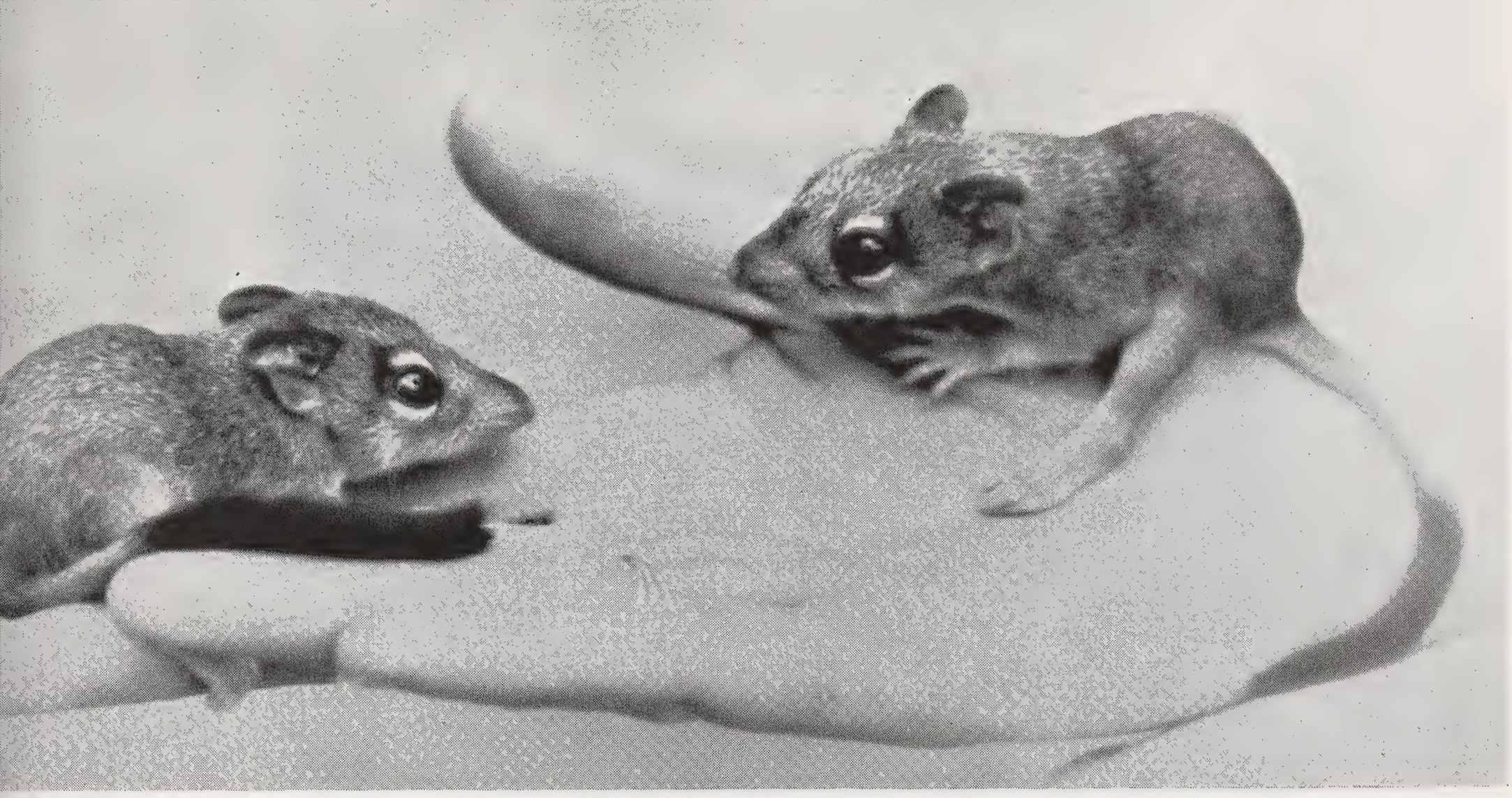
On September 28 the young Tuans opened their eyes for the first time. They were now well clothed in short gray fur with the glossy black hairs of the terminal brush becoming most prominent. They showed instinctive alertness and fear and ran rapidly for short distances in the characteristic jerky manner of the genus. Nine days later when a hand approached them suddenly their mouths gaped open and they uttered the repeated penetrating hisses of warning used by the adults when on the defensive. Two variations of these angry notes are given by the fully grown *P. tapoatafa,* one low and deliberate; the other loud, sharp and insistent, uttered with gaping jaws and every semblance of furious resentment.

Every day saw the young Tuans make progress. They moved about actively when handled, but, strange to say, still clung at times to the mammae of the unfortunate parent. She dragged them along, much to her own discomfort and they released the grip only when they chose to do so. Usually, however, when frightened they now clung to the fur of the mother's back or sides with feet and teeth in much the same manner as young Dasyures. They were left at home in the nest while the mother sought food in the cage at night. By October 27 (at 118 days) the baby animals were seen to be a little more independent of the mother; they did not cling to her as formerly. They were brought into a lighted room at night and given their liberty, which they utilised by darting all over the place, capturing flies, and then sitting up to eat them with penetrating chewing sounds.

By November 5 (127 days) they were half-grown, with a well-clothed silky brush on the tail. They still relied very largely on the mother's mammary glands for nourishment, but an appetite for insects and adult food was fast developing. Their increasing venturesomeness while at liberty in the living room at night was made noticeable by sudden appearances on table tops. Then followed rapid scampering up my trouser-legs to my shoulders, and meteor-like leaps into space with tails fully bristled. Nevertheless they were still very dependent on their mother, for if they were kept from her overnight in a separate cage, morning would find them cold, dormant and able to move only with difficulty. It was at this time (November 27), when driving along the Western Highway at night near Gordon, that I picked up the dead female of the species with a pouch at a stage similar to that of my captive female, showing the complete eight mammae equally developed. The dead female had evidently reared the full number of young. Fortunately the orphans thrown so suddenly on their own resources would be able to make an effort to fend



At 73 days the baby has a strong head development and shows pigmentation in the ear and eye region, and on tail.



At 98 days the young Brush-tailed Tuans are in a fairly advanced stage of development—short-furred still, but the tails are well-haired.

for themselves. It seems that in the case of Dasyures and phascogales, when the young are no longer suckled they must perforce hunt on their own initiative, for, seemingly, the female parent has little idea of taking any of her kills to the nursery.

From the half-grown stage of November 5, the two young Tuans now grew rapidly, and towards the close of November, at the age of four months, they were capable of a completely independent existence. Dashing about on chair tops and sofa backs at night, and lacking the furtive ways of their kind in the presence of man, they showed some of the more intimate and interesting habits of the species at close quarters. When excited or agitated (notably when the time of recapture arrived), they perched momentarily on a vantage point, with naked leaf-like ears upstanding, and vibrated the tail base, imparting a rapid wriggling motion to the whole black-plumed tail. This, of course, is not an exclusive habit of any one marsupial and is seen even in wallabies. At other times, when startled and puzzled, they would progress slowly in short deliberate jumps, rapping first both forefeet smartly on the woodwork or chair back, repeating the action in the same fashion with both hind feet. This staccato tap-tapping sound may also be made with all four feet at once, or with a single forefoot or hind foot. It is at once a very distinctive and interesting feature of the Brush-tailed Tuan. Another phascogale near at hand, hearing the sound, is liable to become infected with the same emotion, and it then repeats the tap-tapping action.

Early in February, 1934, seven months from the time of birth, the young animals were fully grown and mature. The male, as usual, was bigger, stouter and stronger than the female. Like young Dasyures, their high spirits and playful nocturnal antics knew no bounds. Leaping from end to end of the cage, with black tails fully bristled, and careening just as easily upside down across the wooden roof, to turn about in a flash, they passed the hours playing hide and seek with graceful effortless movements while the bright black eyes gleamed in the sharp, prick-eared faces.

In small crevices to which the sharp muzzles could not penetrate, they made an intelligent use of the long and slender manus, and I have watched the young animals inserting the two longer-clawed digits (3 and 2) into such cracks in quest of insect game. The value of such a method in pulling beetles from under the bark is obvious. On rare occasions, in daylight, the animals emerged for a brief period to bask in the rays of the sun. The number of intimate customs revealed in the young lives of these phascogales was in strong contrast to the secretive, furtive habits of the adults; when caught fully grown they rarely, and sometimes never, drop their shy, retiring ways.



BRAYTON EDDY

In Memoriam

Brayton Eddy was one of that fortunate company of people, so limited in numbers, whose lives are made rich by a consuming interest. He seemed to be guided by a testament that knowledge of the lesser forms of life would lead him to a clearer understanding of life itself. His devotion to the study of insect life was contagious. Few contemporary American naturalists have done as much in interpreting to the public both the value and the fascination of insects. After joining the staff of the Society he extended his attention to reptiles and became ever more enthusiastic about this new field of work which offered so many opportunities for education.

His early interest in philosophy, in which he took his Bachelor's degree at Brown University in 1921, soon crystalized and gave direction to his subsequent activities. In order to equip himself he worked as a graduate student at the Biological Laboratory at Cold Spring Harbor in 1931 and at Cornell University during three successive years. In 1935 he did a most original thing in establishing an Insect Zoo, located near Providence, R. I. Several years later he became administrator of the Office of Entomology and Plant Industry for the State of Rhode Island, and then came to the New York Zoological Park in January, 1945, under the appointment of Curator of Insects and Acting Curator of Reptiles, later becoming Curator of Reptiles. He was a member of the American Association of Economic Entomology, the Entomological Society of America, the American Society of Ichthyologists and Herpetologists and other scientific and technical associations.

Those of us who were fortunate enough to know him intimately and to work with him were made happy by his amiability and the natural expansiveness of his personality. It was a delight to observe his deep interest in young people and their entomological or herpetological aspirations. He always had time to see a youngster with a

praying mantis, or some other to-the-youngster-mysterious insect or reptile (in a cardboard box or a milk bottle), whom he invariably welcomed to his office while he explained the creature's life history and habits. Very few people have the time or patience for that sort of thing. Many a boy and girl will remember Brayton Eddy as the first naturalist who took an interest in them.

His death was untimely, although long before it occurred he himself, aware of a serious heart ailment, realized that he was living on "borrowed time." His courage in this situation was extraordinary. He refused to allow it to make any difference in his life's work. One of the last activities he engaged in was a collecting expedition late this Spring in the blistering heat in the Salt Lake plains in Utah. He collapsed on the evening of that day, though after hospitalization he was able to return to his home in New York and his activities at the Zoological Park, where he died some two months later on July 17, 1950. Brayton Eddy made invaluable contributions to the work and growth of our institution. He will be greatly missed. — Fairfield Osborn.

News from the Conservation Foundation

The Staff Reports on Summer Activities

During the summer the staff of the Foundation wound up several major activities initiated last year and began preparations for new undertakings.

A survey of industrial water use and industrial pollution, conducted jointly by the National Association of Manufacturers and the Foundation, has brought an overwhelming return of questionnaires from some 5,000 manufacturers, which will provide a picture of industrial water use that, heretofore, was completely unavailable. The data are currently being analyzed and will be published in the late fall. This study is an outgrowth of the ground water survey completed early this summer, which McGraw-Hill will publish in late winter.

A contract has been negotiated with the University of Pittsburgh School of Law whereby the Foundation provided funds for a survey of Pennsylvania's conservation laws and administrative organization practices. This is part of a long-range program of special studies and undertakings in several large universities. Others already negotiated are the Chair of Conservation at Yale University and the study being made at the Littauer School at Harvard of economic factors affecting the adoption of conservation practices. For this latter work the Foundation has provided fellowships for about six government experts in various fields.

Arrangements have been made for the first conservation workshop for New York City school teachers. Lectures and field trips will "teach the teachers" how to interpret conservation problems to city children, and the program can serve as a pattern for other urban centers.

Our third series of films, "The Web of Life" — two multiple reels in color and sound — has been accepted by the Encyclopaedia Brittanica Films with considerable enthusiasm and will be distributed this fall. John Storer, our photographer, and his assistant have covered the entire country and have brought back more than 10,000 feet of film for our forthcoming "Living Water" series. This material will be edited during the fall. The scrips of eight filmstrips on soil have been completed and Encyclopaedia Brittanica Films will produce them in the course of the next several months.

During the summer President Osborn made a lengthy trip through the far west, including a survey of timber operations in the northwest.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

Three Gibbons in Three Days — and a Raccoon to Boot!

One of the troublesome end-of-summer chores around the Zoological Park is the recapture of our White-handed Gibbon family on Gibbon Island, for cold-weather exhibition indoors. After a summer's liberty in the treetops, these long-armed acrobats are apt to be suspicious of box traps and it sometimes takes several weeks of patient waiting and daily baiting of the trap with fruits before they allow themselves to be caught. Last year it was dangerously far into October before the Gibbon trio was secured.

Expecting the same difficulty this year, and planning ahead for the exhibition of the animals in our new Great Apes House in early October, keepers set out their box traps on September 12. Three days later all three Gibbons had allowed themselves to be caught – certainly a record.

And not only the Gibbons – on the second night the traps were in place, a young Raccoon



NOTE FOR FIFTY YEARS HENCE: On November 8, 1949, the fiftieth anniversary of the Zoological Park, several staff officers of the Park made recordings of extemporaneous talks which they hoped would survive and be in playable condition on the Park's hundredth birthday on November 8, 1999. The recordings—on a disc and on magnetic tape—were sealed in a stainless steel box and on July 28, 1950, it was deposited under a slab at the east side of the main steps of the new Great Apes House. Assisting are (left to right): D. Fortunato, the general contractor of the building; Executive Secretary John Tee-Van, and Quentin Schubert, Superintendent of Construction and Maintenance. The position will be marked on top of the slab.

attempted to steal food out of one of them. It is a wild wanderer, and is now in quarantine in the Animal Hospital.

We Have "Upside Down" Catfish

Specimens of the Upside Down Catfish have recently been received by the Aquarium. These are remarkable for their faculty of swimming either belly upward or right side up with equal ease. In fact, they seem to prefer the reversed position, spending most of their time resting or swimming upside down.

They belong to the group of African freshwater catfishes of the genus *Synodontis,* but exactly what species we have is not known, principally because our specimens are still quite small – less than two inches long. Although these strange fishes and their strange locomotor habits have been recognized for many years, they apparently have never before been imported alive into America – J. W. A.

Feathered Treasures from Ecuador

(*Continued from Page* 151)

There are so many beautiful Tanagers that there is not space for an appreciation of them all. The Red-eared Tanager is lovely, in velvet black, with abdomen and cheek crescent scarlet and the back and shoulders of sky blue enamel. The Red-backed Paradise Calliste must be the most dazzling of this brilliant group. Its pale-green head, deep black wings, turquoise breast and crimson back are gay enough in themselves but when they appear on feathers held as tight as wax, they take on a luminescent quality seen in few birds.

It is among the Hummingbirds that the greatest wonders are found. Best of all is the Sword-bill, a creature with a beak nearly five inches in length, considerably in excess of that of the body. "Incredible" is the descriptive word that comes to mind. For at first glance, bird and beak appear to be separate entities and it is only on second look that they are seen to be one. To keep and maintain this bird for the first time in history is a real triumph for the skill of Charles Cordier, for in doing so he has accomplished a feat long considered to be impossible.

Then there is the little Thorn-bill, with a tiny beak which, Charles reports, is useful for feeding from the flat blooms of the Compositae. The Sickle-bill, with its beak so sharply de-curved as to suggest a scimitar, is one of the most difficult to induce to take liquid from a glass feeding tube. Yet once it has learned, it performs this feat with great facility. Racket-tails, Puff-legs, Train-bearers, Heavenly Sylphs, Hill Stars – all are so lovely in brilliant plumage and graceful flight that they are enthralling in their varied beauty.

Charles and Emy Cordier have again registered a great success, an accomplishment which, through recent years, we have come to expect of them.

* * *

In all, the collection includes 211 specimens of 88 forms, 64 of them new to us. The list follows:

New York Zoological Society's
Ecuadorian Expedition
Received July 20, 1950

(*Denotes species new to our collection.)

Mammals:

*3 Rio Napo Marmosets – *Mystax graellsi* (Espada)
*1 Golden-mantled Marmoset – *Leontocebus tripartitus* (Milne-Edwards)
*1 Ecuadorian Night Monkey – *Aotus gularis* (Dollman)
*1 Mantled Howling Monkey – *Alouatta palliata aequatorialis* (Festa)
3 Azara's Opossums – *Didelphis paraguayensis* (Oken)
*1 South American Woolly Opossum – *Philander laniger laniger* (Desmarest)
1 Ecuadorian Wild Dog – *Pseudalopex culpaeus reisii* (Helzheimer)
1 Kinkajou – *Potos flavus* (Schreber)

Birds:

1 Jardine's Pigmy Owl – *Glaucidium jardinii jardinii* (Bonaparte)
*1 Ecuadorian Sword-billed Hummingbird – *Ensifera ensifera ensifera* (Boissonneau)

*2 White-tailed Hill Stars – *Urochroa bougueri leucura* Lawrence
*4 Boucard's Train Bearers – *Lesbia victoriae aequatorialis* Boucard
*3 Salvin's Sun Angels – *Heliangelus amethysticollis laticlavius* Salvin
*1 Brown Violet-eared Hummingbird – *Colibri delphinae* (Lesson)
6 Gould's Violet-eared Hummingbirds – *Colibri coruscans coruscans* (Gould)
*3 Western Buff-tailed Coronets – *Boissonneaua flavescens tinochlora* Oberholser
*1 Rosy-throat – *Heliodoxa rubinoides cervinigularis* (Salvin)
*1 Amethyst Hummingbird – *Calliphlox amethystina* (Boddaert)
7 Black-billed Emeralds – *Chlorostilbon gibsoni melanorhynchus* Gould
2 Green-headed Emeralds – *Amazilia franciae viridiceps* (Gould)
*3 Heine's Hummingbirds – *Amazilia tzacatl jucunda* (Heine)
*5 Green-tailed Sylphs – *Aglaiocercus kingi mocoa* (DeLattre & Bourcier)
1 Heavenly Sylph – *Aglaiocercus coelestis coelestis* (Gould)
*4 Ecuadorian Copper-tails – *Metallura williami primolina* Bourcier
*2 Quito Tyrian-tails – *Metallura tyrianthina tyrianthina* (Loddiges)
*5 Small-billed Thorn-bills – *Ramphomicron microrhynchum microrhynchum* (Boissonneau)
*7 Comte de Paris' Star-frontlets – *Coeligena lutetiae* (DeLattre & Bourcier)
*4 Collared Incas – *Coeligena torquata torquata* (Boissonneau)
*1 Scissor-tailed Racket-tail – *Ocreatus underwoodii peruanus* (Gould)
*1 Emily's Hermit – *Phaethornis guy apicalis* (Tschudi)
*3 Chimborazo Hill Stars – *Oreotrochilus chimborazo chimborazo* (DeLattre & Bourcier)
*1 Pichincha Hill Star – *Oreotrochilus chimborazo jamesonii* Jardine
*2 Gould's Sickle-bills – *Eutoxeres aquila heterura* Gould
*1 Green-breasted Puff-leg – *Eriocnemis vestitus smaragdinipectus* Gould
*1 Black-breasted Puff-leg – *Eriocnemis nigrivestis* (Bourcier & Mulsant)
*1 Bouquet's Puff-leg – *Eriocnemis luciani luciani* (Bourcier)
*1 Long-billed Lance-bill – *Doryfera ludovicae rectirostris* Gould
6 Orange-breasted Barbets – *Capito aurovirens* (Cuvier)
1 Rufous-fronted Barbet – *Capito squamatus* Salvin
*2 Sclater's Motmots – *Momotus momota microstephanus* Sclater
*1 Many-banded Aracari – *Pteroglossus pluricinctus* Gould
*3 Chestnut-eared Aracaris – *Pteroglossus castanotis castanotis* Gould
*5 Yellow-billed Aracaris – *Pteroglossus flavirostris flavirostris* Fraser
*1 Red-backed Aracari – *Pteroglossus erythropygius* Gould
1 Cuvier's Toucan – *Ramphastos cuvieri cuvieri* Wagler
*3 Western Black Woodpeckers – *Melanerpes cruentatus extensus* (Todd)
*1 Chestnut-crowned Ant-pitta – *Grallaria ruficapilla ruficapilla* Lafresnaye
*1 Mountain Ant-pitta – *Grallaria quitensis quitensis* Lesson
*1 Black-faced Tityra – *Tityra semifasciata nigriceps* Allen
*1 Banded Cotinga – *Pipreola arcuata* (Lafresnaye)
*3 Red-crested Cotingas – *Heliochera rubrocristata* (Lafresnaye & d'Orbigny)
*3 Purple-throated Fruit Crows – *Querula purpurata* (Müller)
*11 Equatorial Cocks-of-the-Rock – *Rupicola peruviana aequatorialis* Taczanowski
*2 Eastern Umbrella Birds – *Cephalopterus ornatus ornatus* St. Hilaire
*4 Long-wattled Umbrella Birds – *Cephalopterus ornatus penduliger* Sclater
*1 Berlepsch's Golden-headed Manakin – *Pipra erythrocephala berlepschi* Ridgway
*3 Ecuadorian Manakins – *Manacus manacus leucochlamys* Chapman
1 Violaceus Jay – *Cyanocorax violaceus* Du Bus
*1 Turquoise Jay – *Cyanolyca turcosa* (Bonaparte)
5 Peruvian Green Jays – *Cyanocorax yncas yncas* (Boddaert)
*1 White-eyed Black Robin – *Platycichla flavipes leucops* (Taczanowski)
*1 Masked Sugar-bird – *Diglossa cyanea cyanea* (Lafresnaye)
*1 Indigo Sugar-bird – *Diglossa indigotica* Sclater
1 Yellow-backed Cacique – *Cacicus cela cela* (Linnaeus)
1 Giant Oriole – *Gymnomystax mexicanus* (Linnaeus)
2 Western Swallow-tanagers – *Tersina viridis occidentalis* (Sclater)
4 Tawny-crowned Tanagers – *Tachyphonus delatrii delatrii* Lafresnaye
*13 Red-eared Tanagers – *Poecilothraupis igniventris erythrotus* (Jardine & Selby)
*1 Orange-breasted Tanager – *Poecilothraupis lacrymosa palpebrosa* (Lafresnaye)
*2 Blue-capped Tanagers – *Thraupis cyanocephala* (Lafresnaye & d'Orbigny)
2 Darwin's Tanagers – *Thraupis bonariensis darwinii* (Bonaparte)
*2 Orange-crested Tanagers – *Iridosornis rufivertex rufivertex* (Lafresnaye)
2 Hooded Mountain Tanagers – *Buthraupis montana cucullata* (Jardine & Selby)
3 Rieffer's Grass-green Tanagers – *Chlorornis riefferii riefferii* (Boissonneau)
3 Lesser Magpie Tanagers – *Cissopis leveriana leveriana* (Gmelin)
*2 Blue-shouldered Mountain Tanagers – *Compsocoma flavinucha somptuosa* (Lesson)

*2 Buff-breasted Mountain Tanagers – *Dubusia taeniata taeniata* (Boissonneau)
*1 Finch-like Tanager – *Oreothraupis arremonops* (Sclater)
*1 Yellow-throated Olive Tanager – *Chlorospingus flavigularis flavigularis* (Sclater)
*3 Yellow-breasted Spotted Callistes – *Tangara xanthogastra* (Sclater)
*3 Northern Blue-necked Callistes – *Tangara cyanicollis caeruleocephala* (Swainson)
*1 Red-backed Paradise Calliste – *Tangara chilensis chilensis* (Vigors)
*4 Short-billed Euphonias – *Tanagra xanthogaster brevirostris* (Bonaparte)
1 Yellow-breasted Grosbeak – *Pheucticus chrysopeplus chrysogaster* (Lesson)
*2 Boissonneau's Sparrows – *Atlapetes torquatus assimilis* (Boissonneau)
1 Chestnut-capped Buarremon Sparrow – *Atlapetes brunnei-nucha brunnei-nucha* (Lafresnaye)
*2 Slaty-backed Sparrows – *Atlapetes rufinucha spodionotus* (Sclater & Salvadori)

REPTILE:

1 South American Boa – *Constrictor constrictor constrictor* (Linnaeus)

THEY WERE BORN ALIVE



Baby Lizards and Their Mother

Most lizards produce eggs from which their young are hatched, but the Common Lizard of Europe (*Lacerta vivipara*) bears living young, producing up to a dozen miniature lizards at a birth. While we have often exhibited the Common Lizard, the birth of young to specimens in the Zoological Park is rare. The six inch-long babies shown above, with the female, were born in July.

This particular lizard has the further distinction of being the only reptile found in Ireland.

ADULTS' DAY AT THE ZOO



. . . but darling, grown-ups like to see these things, too!

There is a point of view, widely held by the young, that a zoological park is maintained primarily for children. Over the years the New York Zoological Society has developed a contrasting philosophy – that while it is necessary to balance instruction with entertainment, presentation of the animal life of the world on an adult level gives children something to grow up to.

Some of our members apparently feel about the same way – and insist on their rights. Mrs. Ben Jorj Harris, one of our members, overheard a bit of conversation in the Gorilla House on Members' Day last June, and illustrated it in the cartoon above.

Venezuelans Learn About Jungle From Beebe-Crane Film

Since our Department of Tropical Research began studies in Venezuela in 1942, Dr. Beebe and Miss Crane have taken thousands of feet of motion picture film in color and selections from it have usually been shown at the January Members' Meeting of the Society. Film taken in 1942, 1945 and 1946 was combined and scored in Span-

ish, and has been distributed by the Creole Petroleum Corporation. Just before his return from his recent expedition to Trinidad, Dr. Beebe received the following note from Arthur T. Proudfit, president of Creole:

"Our public relations people have just shown me a compilation of the audiences to which have been shown your and Jocelyn Crane's color motion picture, *Curioseando en la Selva*. I thought you would be interested to know that through March of this year the picture has been seen by 154,000 persons. It is still going strong, there having been 84 showings in March to 9,995 persons. The list of showings indicates that the picture has been seen all over the country, in the *pueblecitos* as well as in the larger towns and cities.

"We continue to be extremely pleased with the response we are receiving from the picture."

From comments the Department of Tropical Research has heard, Venezuelans are as fascinated by the film's revelations of the natural history of their own jungles as Members of the Zoological Society have been.

PUBLICATIONS OF INTEREST

KEEP THEM ALIVE. How to Keep Snakes, Lizards, Turtles, Alligators, and Crocodiles in Captivity. By E. Ross Allen & Wilfred T. Neill. 24 pp., 3 figs. Special Publication No. 1, The Reptile Institute, Silver Springs, Fla., 1950. 75 cents.

FIELD GUIDE TO THE LIZARDS AND SNAKES OF WISCONSIN. By W. E. Dickinson. 70 pp., 6 figs., 11 distribution charts, 11 colored plates. Popular Science Handbook Series, No. 2, Milwaukee Public Museum, Milwaukee, Wis., 1949. 75 cents.

REPTILES OF AUSTRALIA: Crocodiles, Snakes and Lizards. By Charles Barrett. 168 pp., 56 illus. Cassell & Co., Melbourne, 1950. 27/6.

Here are three publications that should be welcomed by students of reptile life.

"Keep Them Alive," by the director of the Reptile Institute at Silver Springs, Fla., and an associate who has maintained a private collection of reptiles, is for the beginner. It collects in one small pamphlet a surprising amount of practical information about the care, feeding and habits in captivity of reptiles, gives a chart of food preferences for forty snakes, and closes with a bibliography of similar reference works on the care of reptiles. The snake section is particularly full, and snakes in the collections of amateur herpetologists will bless the authors for their insistence on proper cages, minimum handling, etc.

There are a number of handbooks of the reptiles of particular states but few as well designed as Dickinson's "Lizards and Snakes of Wisconsin." The author, curator of invertebrate zoology at the Milwaukee Public Museum, has illustrated in colored drawings the head in two aspects and a section of the body of each of the five lizards and 29 snakes recorded in Wisconsin, with the exception of one snake (the Brown Snake, *Haldea valeriae valeriae*) which has been reported only once. Distributional maps show where each of the 34 lizards and snakes has been found. There is a key for determination of all the forms, brief summaries of habits and descriptions of each. The colored plates, while lacking something in faithfulness of color in a good many instances, are certainly an advance on the more usual black-and-white photographs.

Charles Barrett ("Reptiles of Australia") offers a popular account of Australian crocodiles, snakes and lizards, plentifully illustrated. He quotes from many writers on Australian reptile life, which necessarily produces a somewhat jumpy style, but the material is lively and anecdotal and should be quite useful, at least to the non-professional student. — W.B.

SELECTED INVERTEBRATE TYPES. Edited by Frank A. Brown, Jr. xx+597 pp., 235 figures. John Wiley & Sons, Inc., New York, 1950. $6.00.

The avowed principal purpose of this book is to provide an adequate laboratory manual for students of invertebrate zoology — a purpose that it no doubt more than satisfactorily fulfills. We should like to praise it from another angle, however: that of a general, handy reference volume to help the zoologist (be he student, teacher or curator) to answer questions, innocently put but involving depths and latitudes of learning beyond those of ordinary non-specialists.

Here in one reasonably-sized book are outlines on the anatomy of 128 of our common animals without backbones, together with clear, well labeled illustrations and illuminating side lights on their modes of life and the functions of the various structures described. As aquarists we have noted accounts of a number of aquatic animals, including squid, hard-shelled clams, waterfleas, horseshoe crabs and starfish, that are important to us, and even casual study of what the book has to say about them revealed to us important facts. The 13 experts who collaborated in writing this book well deserve both commendation and thanks. — J. W. A.

New Members of the New York Zoological Society

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Want to be a

COLLECTOR?

There is only one Charles Cordier — bringing back to us the rarest animals from all over the world. But you, too, can be a collector for our Society, right here at home!

We need new Members — lots of them. Five years ago our Members loyally fell to and helped us mightily in bringing in enough new Members to carry our Membership to an all-time high.

Now we urge this help again.

Please send us the names and addresses of people who should be associated with the Society's work.

We will send them invitations to join, mentioning your name or not mentioning it, just as you prefer. A postal card is enclosed with this issue of ANIMAL KINGDOM for your convenience.

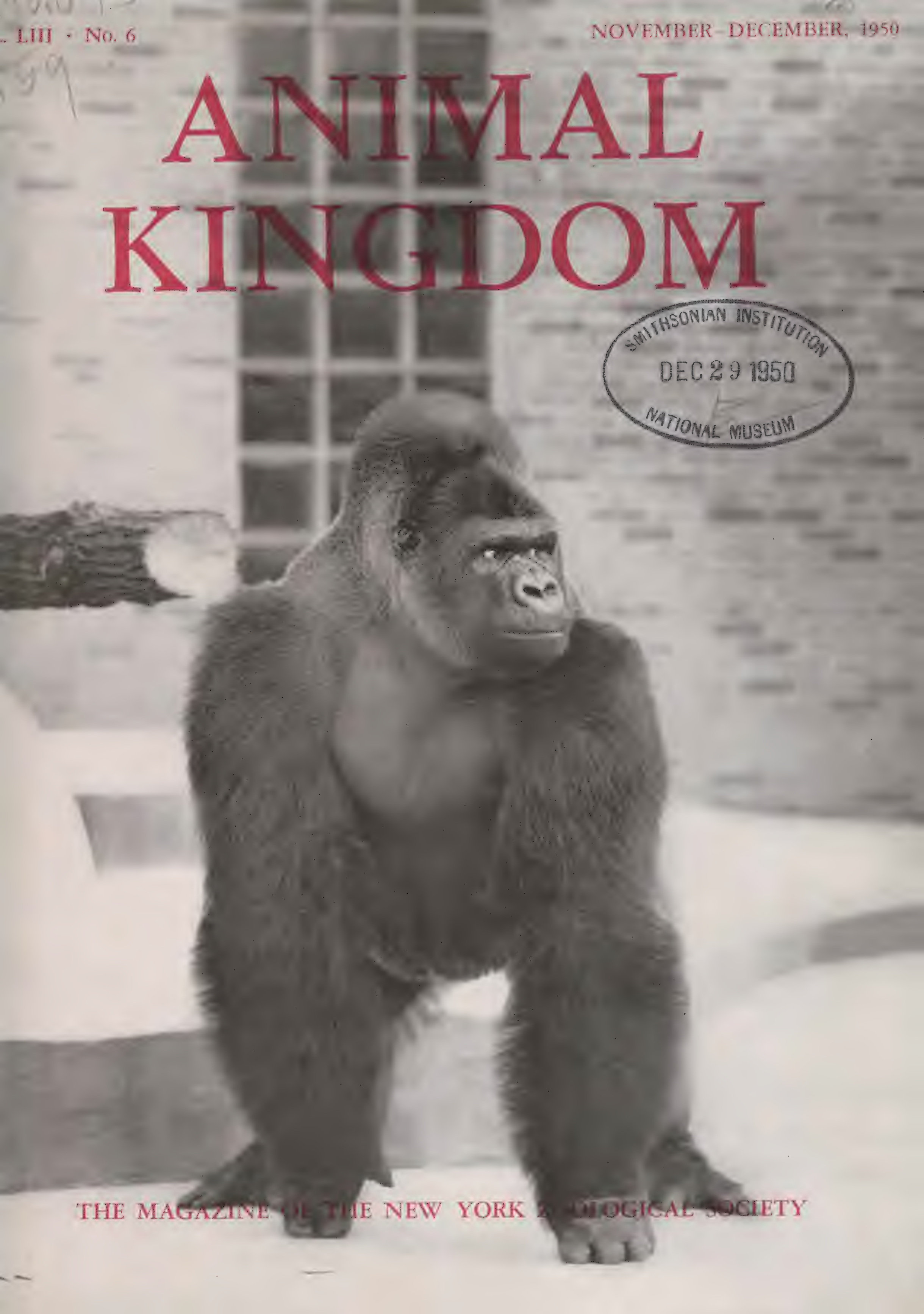
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New York Zoological Society,
The Zoological Park,
New York 60, N. Y.


NEW YORK ZOOLOGICAL SOCIETY

. LIII · No. 6 NOVEMBER–DECEMBER, 1950

ANIMAL KINGDOM

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THE MAGAZINE OF THE NEW YORK ZOOLOGICAL SOCIETY

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ANIMAL KINGDOM

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The New Aquarium

THE GREAT PROJECT to which our institution is dedicating its efforts has recently gained its first significant success. On October 19 the Board of Estimate of the City of New York voted approval of an agreement between the City and the Zoological Society for the construction and operation of the new Aquarium. The terms of this agreement provide that the Society shall now endeavor to raise the sum of $3,250,000, representing one-half of the total estimated cost of $6,500,000. When it has succeeded in doing this, the Commissioner of Parks will recommend to the Board of Estimate that the City make available the remaining share of the cost. It is of interest that the City is expending approximately $800,000 in acquiring 12 acres of land at Seaside Park, Coney Island, for the building and its accessory facilities such as the restaurant and the parking field. Because of the scope and size of this new enterprise, there is no other site in the Greater City that is comparable to the one in question. The agreement with the City also provides that the new Aquarium is to be under the sole administration of the Society, in the same manner as the Zoological Park, and is to be operated as a self-supporting enterprise.

The plans provide for a building unparalleled by any similar institution in our own country or abroad. It should prove an adequate, indeed a brilliant, medium for the exhibition of life from the oceans and inland waters of the world. Many thousands of man-hours have been expended by our organization during the past five years in devising techniques that will give the Aquarium high educational and scientific value and unique beauty. The lack of an institution of such purpose and character in this, the richest and largest city in our country, is a void that must be filled. Almost three-quarters of the earth's surface is covered by water. The abounding life of the oceans and rivers, while mysterious and fascinating, is at the same time an essential part of the life-scheme of man himself. The new Aquarium will be a center of enrichment in the lives of millions of people who will visit it.

Fairfield Osborn

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DEC 2 9 1950

The NEW Aquarium for New York

By DONALD T. CARLISLE







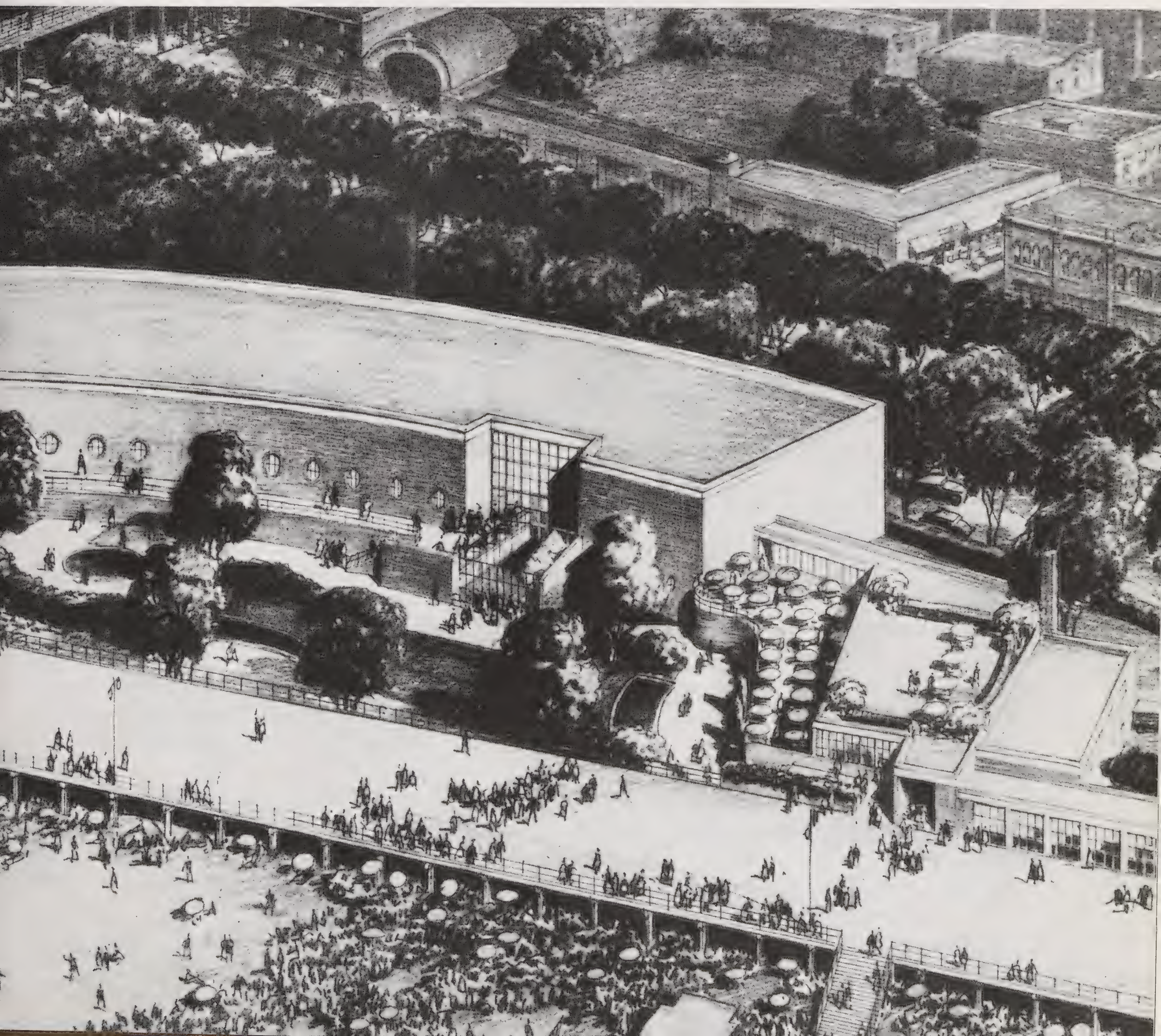


LATE IN THE AFTERNOON of Thursday, October 19, our 'phone summoned us to receive great news. The Board of Estimate of the City of New York had ratified our contract covering construction, equipment and administration of the *new* Aquarium.

This was a tremendous moment. Restoration of the Aquarium is about the most challenging opportunity presented to the Zoological Society since we opened the Park in 1899. The contract, a long and most complicated document, has been a matter of negotiation for more months than we care to remember. Several times these past years it has been brought up for ratification and as often postponed for this reason or for that. Sitting back and attempting to cultivate a long-range objectivity, we had almost schooled ourselves in resignation when great good fortune in the person of our fast friend Commissioner Robert Moses came to our rescue. With the action of the Board on the 19th, the last hurdle has been cleared – so far as officialdom is concerned. Now all we have to do is find the funds.

Younger and more recent members may not be entirely familiar with the Society's interest in the Aquarium. In 1896 this extremely popular and scientifically valuable institution was estab-

There will be much for everybody—the tropical fish hobbyist, the sportsman, the great majority of us who wonder about the life of the waters — in the NEW Aquarium. Architecturally it is functional, imposing.





lished in the old fortress at the Battery. In 1902, as a result of the Zoological Society's founding and administration of the Zoological Park, we were asked by the City to operate the Aquarium, which we did from then until its closing in 1941. When the Battery site became involved in the plans for the Brooklyn-Battery Tunnel the Aquarium became a thing of the past. Curator-Aquarist Christopher Coates and his key staff moved to the Park and set up tanks and laboratories in the Lion House, and there a token Aquarium of some forty tanks has operated ever since. But we never fooled ourselves. This was *only* a token Aquarium, and in the decade since the old one closed we have improved the opportunity to plan the largest, most comprehensive and the most beautiful Aquarium ever known to man.

If you think this is a tall statment, bear in mind that an Aquarium is a definitely measurable thing. Were our new building to be constructed on Manhattan's Fifth Avenue its 1,165 feet of length would actually stretch from below 48th Street to a point beyond 52nd – more than four north-and-south city blocks. It is difficult to convey an adequate mental picture of these mammoth new exhibition halls – a most modern building in feeling and including naturally the most advanced techniques in aquatic animal exhibition– for this art, like nearly everything else, has stepped far ahead in the last ten years.

As a matter of fact, it is probably just as well that the new Aquarium could not be built immediately after the old one closed. In that case we would have started up our new show just about where the old one left off. Now we have the advantage of nearly ten years' planning and experiment which means that we can do many things more interestingly and dramatically than we did them before. In fact, we can accomplish effects that were heretofore impossible.

In the old Aquarium, for instance, there were many conditions which would have made it almost impossible for us to install and operate the very first exhibit planned for the new building – the Clouds-to-Earth exhibit, a moving dioramic demonstration of the water cycle. We have in the last months become more than ordinarily conscious of our dependence on water. The Clouds-to-Earth hall will forcefully show the role which water plays in the continuance of all life upon the earth.

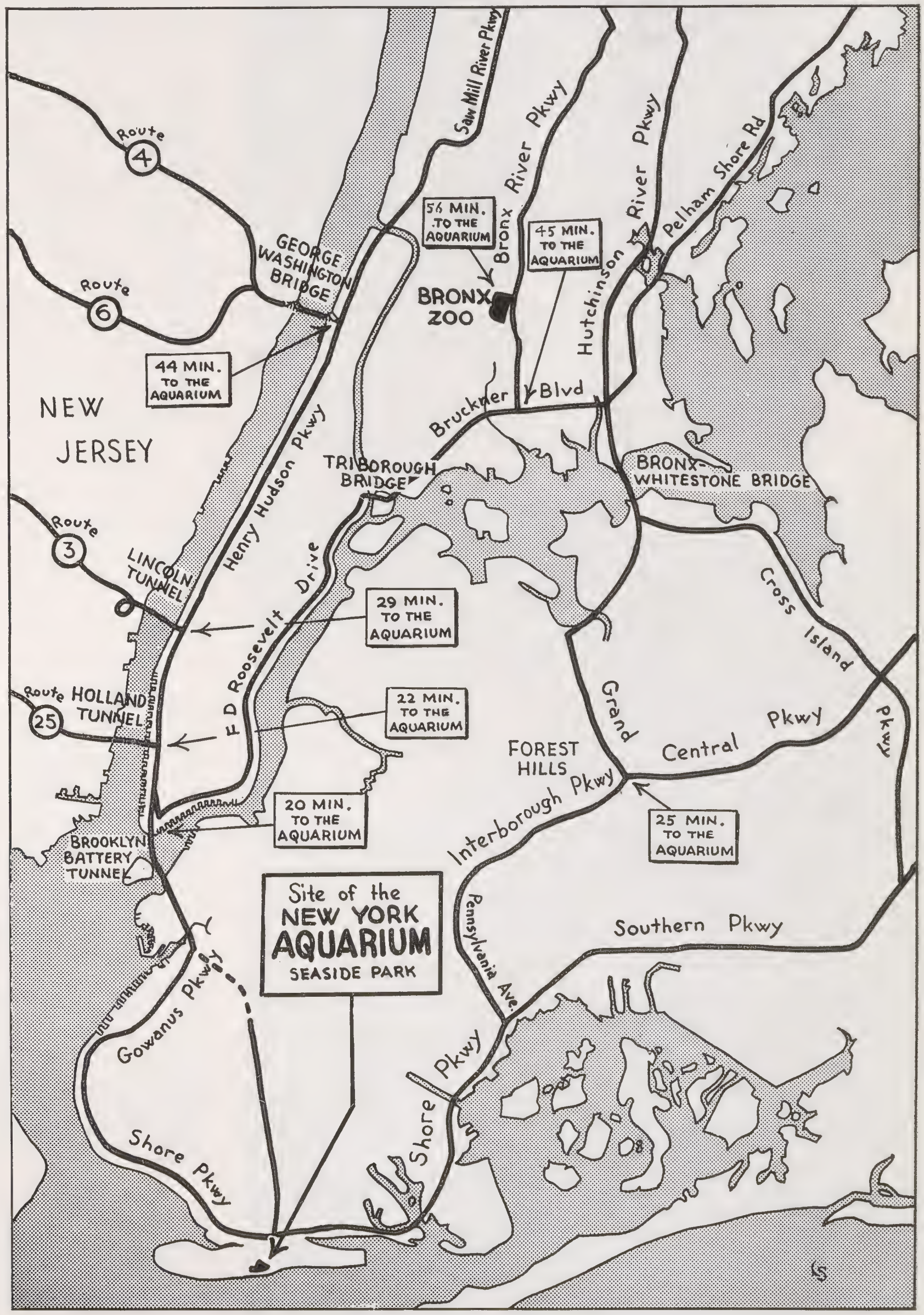
From this 40-foot long Clouds-to-Earth exhibit –which provides the keynote for the exhibits as a whole–visitors enter a series of five great halls

in which will be found practically every form of aquatic life that can feasibly be shown alive in our climate. There will be something on show for everybody. Every angler, whatever his specialty, will be pretty apt to find his favorite finny friends in one spot or another, whether they be steelhead trout, tarpon, sea-bass, muskellunge or some obscure freshwater species from the headwaters of the Nile or Congo. Fresh and saltwater sporting fishes will be found in wide range throughout the building, located largely by their points of origin.

Vying with sportsmen in their ichthyological ardor is that vast army of living-room fish farmers, the tropical fish enthusiasts. For these the new Aquarium is also prepared. It is planned to show regularly several hundred tropical species, many of which never find their way via the dealers into the fireside aquarium. As many of you know, Christopher Coates has for years carried on his fish-lovers' column, first in the *Sun*, now in the *World Telegram & Sun*. Naturally the great audience of fireside fanciers will be gunning for him in his new environment. He is ready.

Exhibits will comprise far more than fishes, which of themselves will range from the tiniest freshwater tropicals up to the largest sharks that can be accommodated to indoor display condi-

e Aquarium will be built this site, called Seaside rk, at the east end of ney Island. The City has ught these twelve acres.

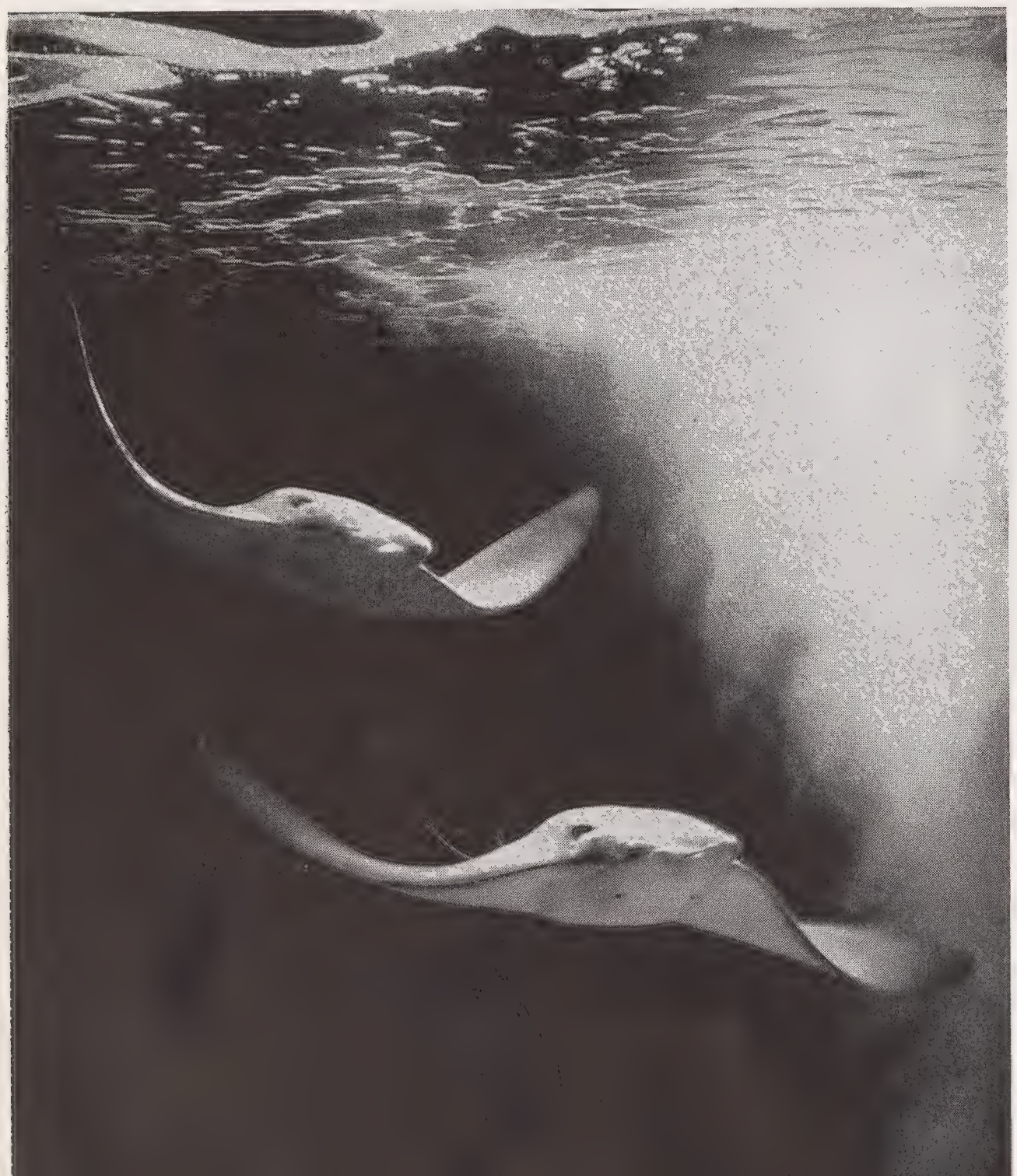


A great network of express highways makes it easy to reach the Aquarium by car from any section of New York's metropolitan area.



The "fearsome Octopus" is not as fearsome as it is reputed to be, but it always makes a popular exhibit.

Cow-nosed Rays can be displayed with startling effect in the enormous tanks that are planned for them.



tions. The largest indoor tank ever built is planned for an all-time high in shark-shows, a tank 50 x 25 feet in size. But besides the huge and terrible among fishes, their aquatic reptilian and mammalian rivals for size or ferocity or both will be found in the new Aquarium. In a great corridor extending nearly the length of the exhibition building and parallel with the five great halls, exhibits are planned for the fullest possible range of aquatic reptiles and amphibians. In two oceanariums on the south side of the building you may expect to find marine mammals in size up to sea elephants and porpoises. We hope and really expect to show a white whale. There will be two penguin shows – each as fine as, and even more bepenguined than the new exhibit at the Zoological Park, and in the garden along the south side of the building the pools will be frequented by a good representation of the more interesting aquatic bird forms. For the information of the uninitiated, professional aquarium people refer to all aquatic birds as "ducks." Many "ducks" will be shown – we suspect including flamingos, pelicans, cormorants and such. We have neglected to mention our plot respecting invertebrate aquatic life – and we plan definitely for a fine aquatic insect show. So much for the best of exhibition intentions!

While most visitors to the new Aquarium will come there as sight-seers, an exhibit of this scope will hold interest for many others besides the abstract fish-lover and the idly curious. The great purposes of such a demonstration are educational. These lie, of course, along two lines–the Aquarium as a research center and the Aquarium as a teaching source.

The old Aquarium at the Battery was long and most favorably known as a marine biological station. Its collaborative research work included contacts and active interrelations with a high percentage of the important universities, medical schools, hospitals and most of the better known laboratories where work on marine forms is advancing our knowledges. This position has been maintained by the technical staff throughout the interval of the interim Aquarium at the Park. Under most difficult working conditions, Christopher Coates and James Atz, Drs. Ross Nigrelli and Myron Gordon have kept up the prestige of the New York Aquarium. Now, in a great

new building there is space for the growth of research programs beyond anything before possible.

It is equally on our minds to equip the new Aquarium for full service as a teaching source. Special arrangements for school groups will be made. A lecture-hall or auditorium, work and study-rooms, rest and cloak-rooms are contemplated. We hope to provide special accommodation for children's lunches. Space will be provided for parking school buses.

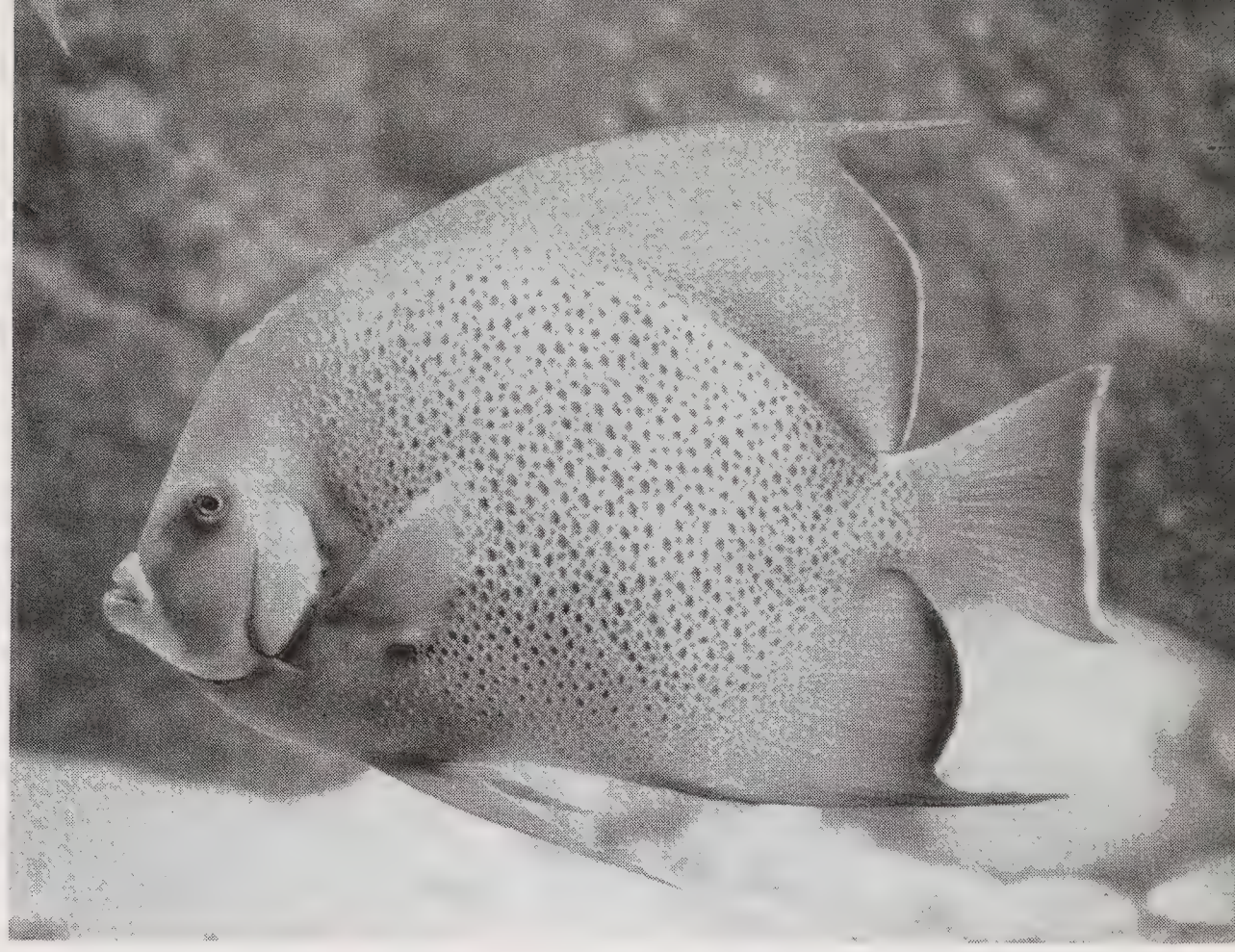
The Aquarium thus will come back into our lives as a fully implemented member of the great New York galaxy of cultural institutions. It will be equal to any of them in scope. Because it will be new it will be ahead of them in beauty and in techniques of exhibition.

This is most appropriate since the plans for the *new* Aquarium fit so completely our Society's obligation to the City and to the country at large. As President Osborn recently remarked:

"We of the New York Zoological Society believe it is essential that Americans should keep moving ahead with cultural and recreational development—especially in times like these. There are forces in the world today that would like to see America reduced to a mere survival basis—everything for guns and nothing for the things that make life interesting and worthwhile. But that isn't the American way of doing things."

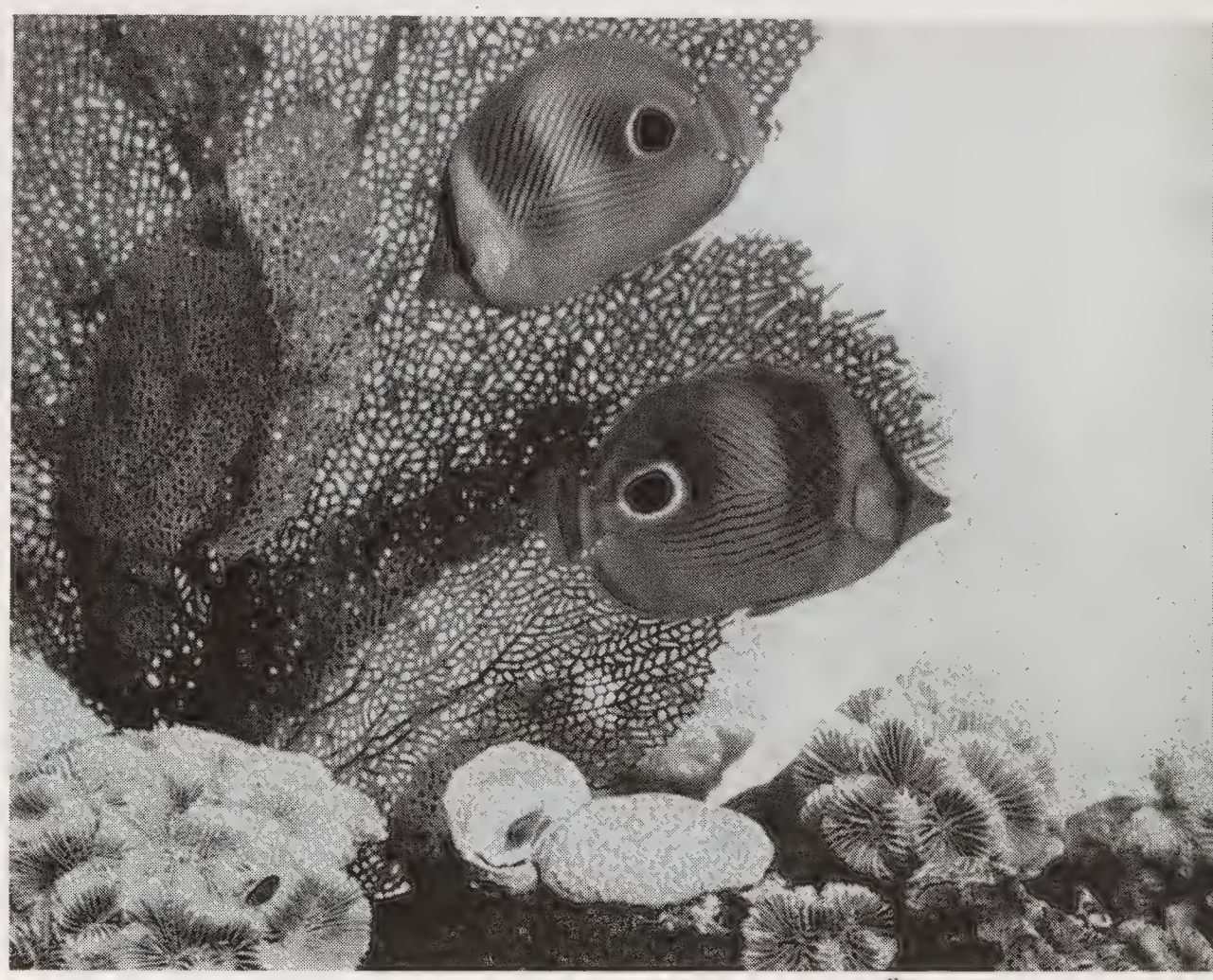
Vice-President Laurance Rockefeller also commented on the Aquarium. "I believe it is highly important that we Americans should keep moving ahead with all essential cultural and recreational developments, even during the pressures of the present world situation. Consequently, the Zoological Society intends to do everything in its power to cooperate with the City to make this proposed great new Aquarium a reality."

Situated on a tract of some twelve acres' extent along the boardwalk in Seaside Park, Coney Island, the *new* Aquarium will be quickly and easily accessible to all parts of the metropolitan area, including Westchester, Staten Island and New Jersey. It is but 20 minutes by car from the Manhattan end of the Brooklyn-Battery Tunnel, three-quarters of an hour from the east end of the George Washington Bridge, less than an hour from the Zoological Park and only some 25 minutes from Forest Hills. Midtown Manhat-



Marine tanks will contain schools of the beautiful and graceful Black Angelfish from the West Indies.

Once more we will be able to exhibit the smaller but spectacular sea fishes — for example, the Four-eyes.



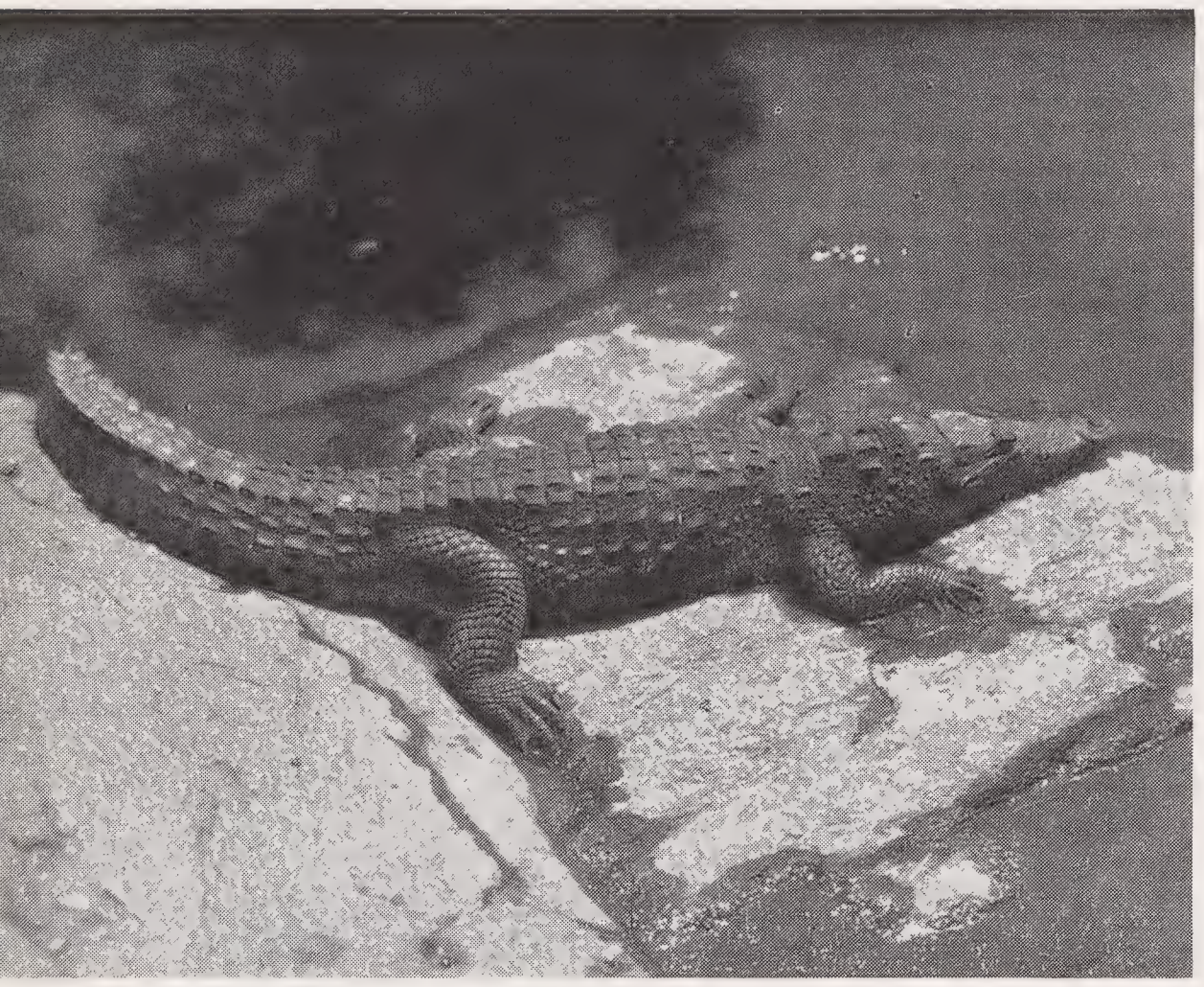
Flower-like, brilliantly colored Sea Anemones — true animals—can thrive in an Aquarium such as we plan.



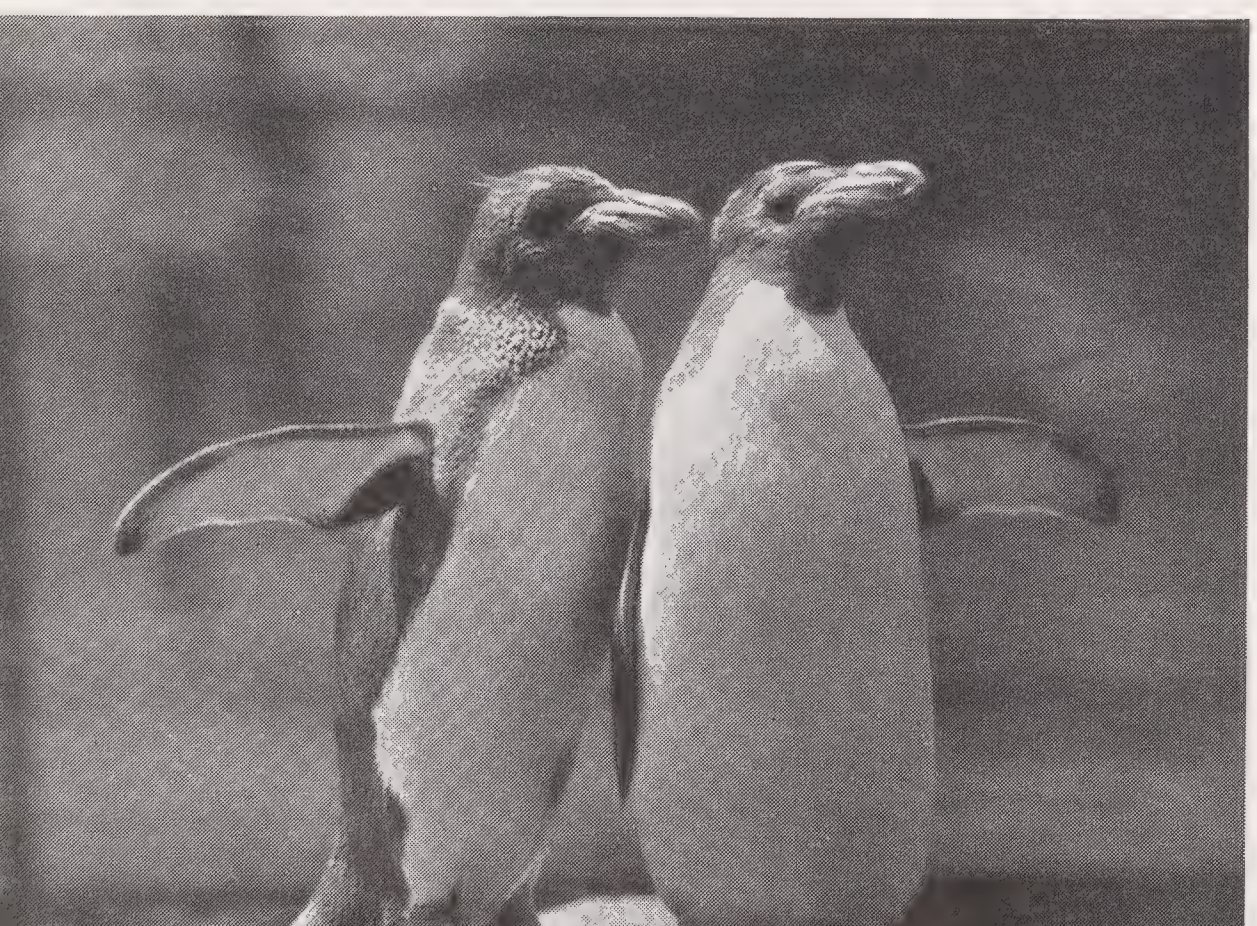


Seahorses will be a standard exhibit—possibly even big ones from the Pacific, twelve inches in length.

One of the more spectacular exhibits will be a swamp scene containing crocodilians, amphibians, reptiles.



Two air-conditioned Penguin Pools are planned and it will be possible to show them above and below water.



tanites will be interested to know that it will take less time (over a more scenic route, too) to go from their homes to the Aquarium than it does to go to the Zoo. The West 8th Street stop on the B.M.T. Subway is right opposite the Aquarium, connected by overhead passageway to our main entrance.

Plans provide for ample parking facilities and there will be an excellent restaurant on the premises to provide everything from a quick snack to a full shore dinner. School children in organized groups will be admitted free. All others will pay an admission fee at all times — as low in amount as possible in line with operating costs, for, once built, the Aquarium is planned to be self-sustaining.

It is estimated that it will take a year and a half to build this magnificent structure, and then six months will be required to make it ready to receive the public.

If you have further questions after reading this brief summary of our plans, send them in. The question about the Old Aquarium we hear most often is: "What became of the fish?" Well, whatever did happen to them, happened nearly ten years ago. So far as the actors (the fishes) are concerned, the *new* Aquarium will open with an entirely new cast.

* * *

Announcement of our plans for an Aquarium brought warm endorsement from the *Times* and the *Herald Tribune*. In case you missed them, here are two editorials:

Editorial in the *New York Times* on Tuesday, October 24.

FOR A NEW AQUARIUM

There should be general satisfaction in the signing of a contract, after long negotiations, between the city and the New York Zoological Society to provide $6,500,000 for the magnificent new aquarium which is to be erected at Seaside Park, Coney Island. Under the contract terms, the society will endeavor to raise half the sum required, and when it does the city will provide its equal share. The plans for the aquarium give further evidence of the imaginative thinking that Fairfield Osborn has brought to the "zoo." This has been shown by many forward steps at the park in the Bronx, including the children's zoo, the farm, the African Plains development, the conservation exhibit and, most recently, the extraordinary great apes' house.

The new building at Seaside Park will be nearly as long as six city blocks. Since the whole conception is to give a unified impression of the water world and its denizens with fin, fur and feathers, the society staff has chosen water itself as the key to the exhibit. Clouds



Helpless as they are on land, the enormous Sea Elephants are swift and graceful in the water. We will provide a huge swimming pool for them, and with good luck may be able to show a fully-grown adult, some of which reach the astonishing length of twenty feet.

will actually form, rain fall, and water flow back from brook to creek, to river, to ocean; thence to rise again and form clouds. One tank alone, the largest indoor tank in the world, will hold more than 62,000 gallons of water. A coral reef hall, an oceanic hall, and a hall of tropical fresh water life, where tropical fish will play, are only a few of the diversified exhibits which are planned.

Mr. Osborn and his associates are to be congratulated on the scope of their planning for the new aquarium and for pressing their negotiations with the city to a successful conclusion.

Editorial in the *New York Herald Tribune* on October 23.

THE AQUARIUM

The old Aquarium at the Battery went out of business nine years ago this month, and New York hasn't been the same. It made way for the Brooklyn tunnel, and while Castle Clinton will again rise in proud restoration the fish are forever gone. Other attractions we have in endless profusion—museums, botanical gardens, libraries, zoos, planetarium, parks, beaches and so on and on. But these are no substitute for the pleasures of an aquarium.

When Mr. Moses' bulldozers drove the fish out of Battery Park, which was probably all for the best, there was a promise of a great new aquarium in Coney Island. This was to be sort of an aquatic counterpart of the zoological park in the Bronx. The project was never abandoned, but Hitler and then the Russians, took over the headlines. And if many a New Yorker felt an unidentifiable void in the civic psyche, it was simply the lack of the old Aquarium.

So now there is a special spine-tingle to the news that the city fathers, including Mr. Moses, and the New York Zoological Society have not forgotten. We are to have a new Aquarium after all, bigger and better in every way. The Board of Estimate has agreed to provide $3,250,000, provided the zoological society puts up a matching sum within three years. (Comptroller Joseph calls it an "unnecessary expenditure at this time," which is only what one expects from a good comptroller). This project is no pipedream. The land, twelve acres at the east end of Coney Island, is bought and ready. Every blueprint has been drawn; construction could begin tomorrow. Naturally, the new Aquarium will excel any in the world. All that remains is for the New York Zoological Society to raise $3,250,000, and its directors expect to do exactly that. We approve and applaud. Let the good work go swiftly forward.

Right Thing, Wrong Time

That's What Animal Behaviorists Call "Displacement Activity"

By EDWARD A. ARMSTRONG

The naturalist today no longer thinks that by remarking that an animal does something or other "by instinct" he is explaining anything. We know that there is an instinctive element in much human behavior and that an intelligent element is involved in some kinds of animal behavior, so the old rough and ready conception of men and animals being motivated by intelligence and instinct respectively has broken down. Whatever meaning the naturalist now attaches to the much misused word "instinct" it is merely a label for some kind of activity and not an explanation of it. More important are the answers to such questions as, "How are the various things an animal does expressions of what takes place in the animal? How are the processes in the creature, which result in its behaving in a certain way, linked with one another? How do what goes on in the animal and the influences it receives from its surroundings interact with one another to result in its doing this or that?"

A simple example will make the issue clearer. What are the stages by which the seizing of its prey by a hawk is linked with the feeling of hunger which set in motion the hunting activity which ended when the bird's talons gripped its victim? There is a chain sequence from the vague feeling of hunger to the less vague hunting activity and the quite precise behavior of sinking its talons into, say, a mouse. Various things which go on in the bird, as well as different things which it sees, hears, and so forth, act as triggers to set off certain types of behavior. What are these and how do they work? Once we begin to ask such questions and make the experiments they inspire we find ourselves trying to "break up" items of behavior into elements of various types. We discover, for example, that if a bird is in the physiological condition for some activity such as hunting prey or courting a mate, a comparatively simple cue is often sufficient to press the trigger which sets off that particular type of behavior. What is increasingly being realized is how very simple most of these cues are. Of course this fact has been made use of for a long time by practical people concerned with getting something for the pot. The wild-fowler uses wooden decoy ducks to attract his quarry within range. He knows that a rather crude model will be effective in bringing the birds down and that it is unnecessary, for example, to stick real feathers on the decoy or set a stuffed duck afloat on the water. The fisherman uses a "spoon" to lure and catch fish. The "spoon" is utterly unlike a small fish in almost every respect except those which matter – its size, its glistening appearance and its motion through the water; but those are the vital cues and are quite sufficient to set off the hunting behavior of a pike or bass. Seeing the small, sparkling moving object, the hungry fish is impelled to attack – and thus it ends in the fisherman's basket. It is beside the point to say the fish was silly. It is "tuned" to respond in that particular way to that kind of object, and the system is simple, economical of energy and perfectly efficient, apart from man's craftiness. A fish which did not attack until it had carefully scrutinized its potential prey to make sure it really had fins, tail and gills would starve.

The same principle of economy of cue applies to many types of reaction among animals of all kinds. A part or aspect of the whole is sufficient to elicit the appropriate behavior. The display of the red breast feathers of the European Robin is a threat. Fighting robins, which I see frequently on my garden wall, posture at each other with their heads in the air and their breasts puffed out, displaying the red danger signal as conspicuously as possible, but experiments show that robins will attack a mere bunch of red feathers as if the whole living bird were there. Jackdaws will mob a predator which has captured and is carrying off a member of the flock but they will also mob a person carrying a black, shining bathing costume, for it has the qualities which release that kind of behavior. Sound signals are often very precise and simple. The rich, deep double note of the European Cuckoo can be easily imitated by blowing into one's clasped hands. It has been found that a Willow Warbler will demonstrate at a person making this call exactly as it demonstrates at a real cuckoo. At the warning cry of the parent a chick within the shell may cease to peck, remaining motionless as it does when the alarm call is uttered after it has hatched. These reactions are inborn, not learned by experience.

Thus a good deal of what animals do can be accounted for simply — up goes the signal, bang goes the reaction. But sometimes the situation is different. Instead of the creature doing something or other in response to the signal which has the trigger effect, it performs some quite absurd and inappropriate action. The coin goes into the slot machine a hundred times and it duly delivers a bar of chocolate, but the hundred-and-first time we are presented with a box



All Photos Copyright by the Author.

"Fidgeting" with a stick from the nest, as the Gannet in center is doing, is a displacement activity brought on by the presence of an intruder near the nest.

of cigarettes! Something has gone wrong with the works, but what, exactly, has happened? Such breaks in the usual linkage of behavior are of great interest. If we knew more of how they occur, of how an animal's responses get sidetracked and jolted out of their proper groove, we would have a much greater insight into its normal behavior. Just as the psychologist or medical man can learn about the normal functioning of the human mind or body by studying conditions when something has gone wrong, so those interested in the psychology of animals may learn from behavior which is not of the usual stereotyped kind.

Everyone who has paid close attention to animals has seen these odd, inappropriate actions, though not everyone has noticed their significance. An agitated or enraged cat will sit down and wash herself; a hen, released from the coop, will feed quietly for a time and then, suddenly, for no apparent reason, rush madly across the field; a raven disturbed at the nest will pull up pieces of grass. When I alarmed a Nuthatch taking food to the nestlings it performed a type of sexual display. A Black-headed Gull, on seeing me near the nest, flew a yard or two to the water and began to bathe.

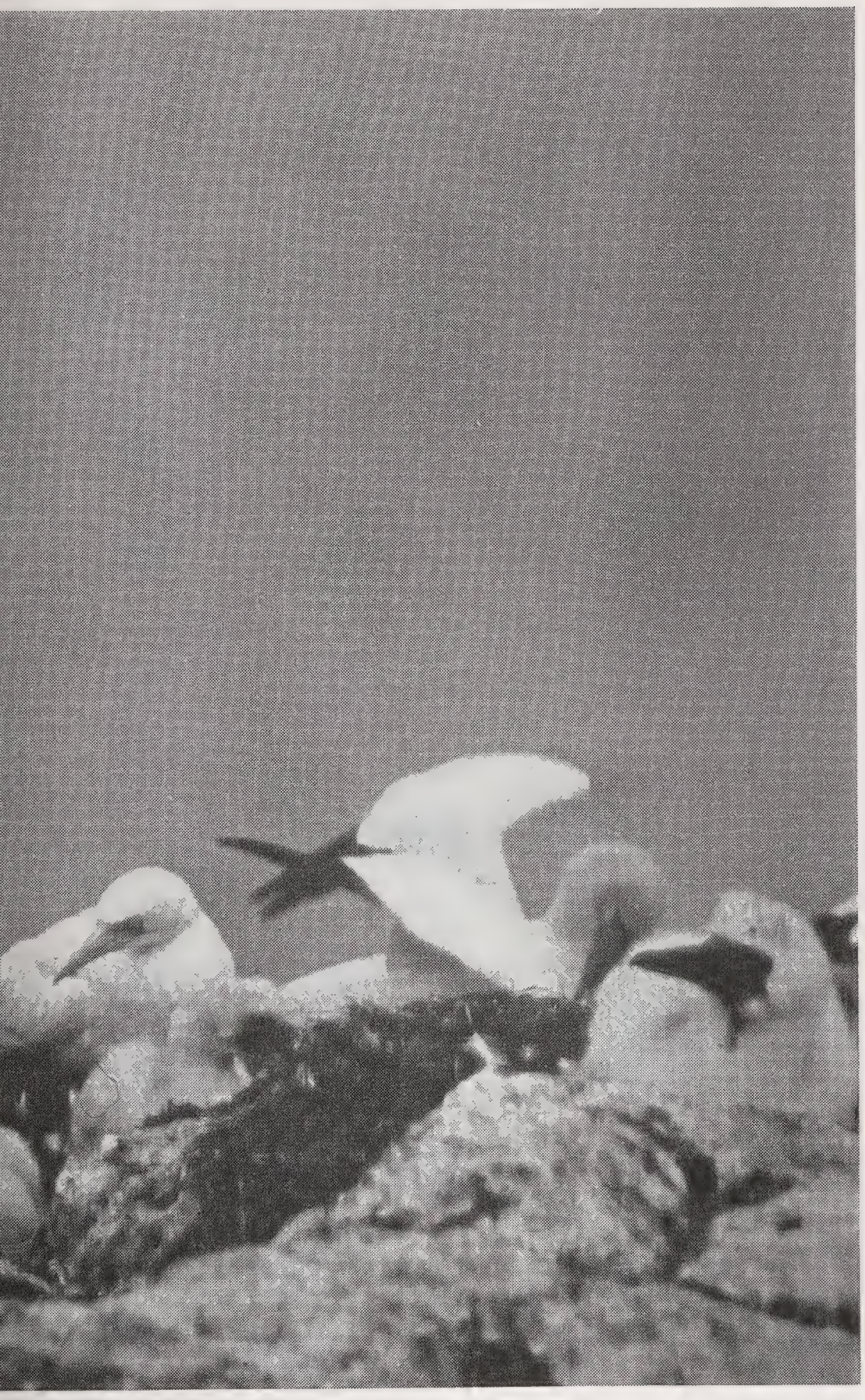
Many bird-banders have had the curious experience of hearing a bird sing as it flew away after being released. Skylarks sometimes burst into song after escaping from a hawk. The sentimental bird-lover likes to think that in such circumstances the birds are expressing their joy by a little paean of thanksgiving on achieving their freedom once again, but this notion does more credit to their hearts than their heads, as is shown by another illustration. When W. H. Hudson shot a Chestnut-shouldered Hang-nest it fell wounded into a stream — and sang. In such cases it is apparent that the shock has upset the normal linkages of the bird's responses. Human beings sometimes act in a comparable abnormal way, as, for example, a man in peril on a cliff near the Golden Gate in San Francisco, who is reported to have burst into screams of hysterical laughter.

One of the most characteristic things about these "displacement activities," as I have called them, is that they are often performed in some odd, incomplete or disorientated way. When a



bird photographer, waiting in his blind, is trying to photograph a bird of the plover family, such as a Ringed Plover or Lapwing, he is often exasperated by the behavior of the bird. Instead of returning to its eggs it will pick around here and there as if feeding, but if he scrutinizes it carefully he will observe that it never picks up anything. It makes the motions of feeding but does not bring the activity to its consummation. Some water birds, such as the Great Northern Diver, dip their bills into the water as they swim around keeping a watchful eye on an intruder at the nest, but it is doubtful if they drink. An agitated turkey was seen to rush to a fountain and make the motions of drinking but did not swallow any water.

Occasionally the behavior is of such a kind as to be harmful to the bird's own interests and so inappropriate that it would endanger the sur-



An example of "displacement feeding" among Gannets. The one on the left is eating its own nest; the bird on the right is bowing.

vival of the species if it were to become general. Some species of tern will stab their own eggs and thus destroy them, if they are alarmed; other birds tear their nests to pieces. This has been recorded of birds as various as cranes and birds of paradise and may occur after the eggs have been taken. People have been known to behave in a comparable way, breaking crockery or furniture in their rage or vexation. When in the forest of Central America I noticed that when my presence was discovered by Capuchin Monkeys they would shower down twigs and leaves. I do not think this can be regarded as an effort to annoy or injure me; rather it was an expression of alarm and nervousness.

It sometimes happens that a thwarted or frightened bird will shake out its plumage – another type of displacement activity. A broody hen removed from the nest will do this. I have seen injury-feigning birds flutter from the nest, trailing along the ground apparently seriously wounded, and suddenly, as if realizing that nobody was being deceived, stop, draw themselves up, shake their plumage vigorously – and walk back on to the eggs. The behavior is so reminiscent of the human gesture of shrugging one's shoulders that I have sometimes speculated as to whether this action may have been inherited by man from subhuman ancestors. Whether or not this is so there is a curious similarity between the manner in which human beings fidget with some object or other when nervous and the picking up or manipulation of stems or twigs by excited or agitated birds. The gesture of scratching the head when puzzled also seems to be of this type.

Sometimes the "displaced" item of behavior is not merely incongruous but becomes incorporated into its new setting in such a way as to be of advantage to the species. Crows, like many other birds, wipe the bill on a branch when agitated but their gaudy relative, the Greater Bird of Paradise, performs the same action in intervals of its display and it seems to have become, to some extent, part of the display. Herring Gulls tear up herbage when annoyed but the gesture has acquired significance for other gulls and corresponds to the showing of its teeth by an angry dog. It has become a useful threat signal, warning intruders to keep off. Many birds pick up material near their nests when frightened. Ringed Plovers pick up and throw pebbles when male and female are changing places on the eggs. The activity has become a ceremony, enabling the change-over to take place smoothly. Preening is very commonly performed as a displacement activity, sometimes in intervals of fighting, but among cranes it has become a threat signal.

Thus such displaced activities may become meaningful in a new setting through a natural form of conditioning – the process by which, when some action frequently accompanies another action, it may gain the same significance. Conditioning is a frequent process among animals. If you usually carry a walking stick when going for a stroll your dog will jump up ready to

accompany you as soon as he sees you going over to grasp it. My chickens come rushing to be fed before they see me if they hear the rattle of the handle of the bucket. This kind of conditioning has happened in regard to the displacement activities just mentioned, and the response to them, when they have acquired significance as signals, has in the course of time become inborn.

The same kind of thing has happened with displacement activities which have become part of the signal language of a bird or other animal. Thus the movement of dipping the bill into the water, which is for some birds just an outlet for excitement, has become incorporated into the courtship display-signals of others, particularly of various species of duck. The displacement activity, however incongruous, adds vividness and effectiveness to the total display and therefore in the course of evolution has become assimilated into this new context to constitute an integral part of the display. Individuals which acquired this addition to their repertoire of courtship gestures were apparently more successful in obtaining mates and leaving progeny, and so the display in which the displacement activity was "embedded" gained survival value and was perpetuated.

Possibly displacement activities have contributed to other forms of behavior besides display. We have noted that it is not unusual for agitated birds to pull up grass or fidget with nesting material and other objects near them or to displacement-preen. An Eider Duck has been seen plucking down from her belly when frightened from her eggs. Is it not likely that the custom common to many species of duck of plucking down from their bellies to line the nest may have arisen in just this way? If long ago some ducks acquired the tendency to pluck their own down when disturbed at their nests they were presumably more successful in leaving descendants because of the warmth and concealment provided by the down. Ducks which leave their nests in the usual way to feed without being disturbed by an intruder

Another familiar manifestation of nervousness is shown here; a Red-throated Diver pretended to drink as a photographer approached.





draw a warm quilt of down over the eggs. Robber birds such as crows and skuas have never learned to look underneath. Undoubtedly the habit of plucking down and placing it around the eggs is advantageous to ducks.

In an earlier article by our present writer (Animal Kingdom, Jan.-Feb., 1950), discussing the "injury-simulation" of birds, it was mentioned that when a bird flutters away from its nest or chicks, as if ill or injured, we can sometimes detect in its performance items of behavior from other contexts. The more closely we observe such injury-feigning antics the more plausible it seems that they incorporate displacement activities. For example, in the injury-feigning display of some of the waders it is noticeable that the tail is fanned as in courtship. In other such displays there are movement-patterns from the threat display. There is no time when birds are more apt to get into an agitated state than when their eggs or young are in danger, because they are then the victims of conflicting urges – the self-preservation urge to flee from danger and the parental urge to protect their hostages to fortune. This being the case it is on such occasions that we would most expect to find birds performing displacement activities. Observation shows that this is indeed so and it seems that some of these displacement activities have become ritualized into injury-simulation. Here, then, is another example of how those birds which have most effectively incorporated various items of behavior into a form of display have been most successful in the evolutionary struggle.

Down from the Eider Duck's belly is visible under this nesting bird. It may pluck down when frightened from its nest; thus may have arisen the duck's custom of covering its eggs.

Every field naturalist will find it of interest to keep on the look-out for displacement activities. Once one's interest has been directed to them they are found to be quite common. There are few aspects of the study of animal behavior of more interest than the process by which the quite incongruous movements of thwarted or excited birds have become ritualized into display-movements and other activities and adapted to serve important functions quite different from those for which they were originally evolved.



PLAY AND AFFECTION
ARE IMPORTANT TO A GORILLA

The Great Ones

Camera Studies of the Anthropoid Apes



AN ATTENTIVE MOTHER:
THE WHITE-HANDED GIBBON



A BABY ORANG-UTAN
HAS MANY PLAYFUL MOMENTS

THIS CHIMPANZEE USED TO PLAY
WITH A DINGO PUP





A New Home for Our Great Apes



By LEE S. CRANDALL

When Andy, our young Orang-utan, assisted President Fairfield Osborn in breaking the ribbon that signalized the opening of the new Great Apes House on October 12, it may be presumed that his immediate interest lay in the bunch of grapes that joined the ends of the ribbon. Nevertheless, his act was one of consequence, for the Great Apes House is the first major exhibition building to be opened in the Zoological Park since the Zebra House was completed in 1914. And it may very well be the last, for while plans for the future include numerous renovations, extensions and installations, no additional large all-year building is now contemplated.

In 1941, when post-war plans were in the initial stages, a Great Apes House was a major project. Some day, we should need such a building. It would house only anthropoids or man-like apes: the Gorillas, the Chimpanzees, the Orang-utans and the Gibbons. We would show them behind glass, as far as possible, in commodious rooms, with ample public space. Out of doors, there would be large enclosures, separated from each other by high walls and from the public by broad water moats. Little by little, in the hands of Aymar Embury II, pencilled sketches grew into formal plans, which awaited only the right moment for activation.

As these ideas developed, so did Makoko and Oka, our infant Lowland Gorillas, which had arrived in September, 1941. Makoko then weighed 28.16 pounds, and Oka 20.46. In the care of Keeper James Reilley, they grew rapidly and it was soon evident that larger quarters than the Lion House nursery must be provided. This necessity led to a temporary remodelling of the interior of the Primate House. This was completed early in 1943 and the young Gorillas were moved in. Although the two were closely attached — and still are — Makoko had become so rough in play that he and Oka could spend only an hour or two together daily.

All went well for six years. By 1949, with Makoko weighing in the 300's and Oka only a hundredweight behind, it was acknowledged that something must be done. Our Gorillas were approaching maturity, quarters were becoming cramped and bars appeared to become more flimsy. An arrangement was made for the sharing of the $386,000 cost by the City and the Zoological Society, plans were dusted off and on August 15, 1949, the actual work of construction was begun by D. Fortunato, the contractor. The intricate task neared completion late in the summer of 1950 and October 12 was set as the opening date. That meant installation of the animals a week earlier, so that they would be completely at home for their house-warming.

When the first bulldozer turned the first ton of earth on the projected site, we were already at work on moving plans. No one, as far as we know, had ever attempted to change the abode of a nearly adult Gorilla — and we had to transfer two. How would they react to the discomforts of crating and how would they

accommodate themselves to new surroundings? We could only plan and hope that we planned correctly.

We meant to begin the operation on October 6, and so, in order to have a full day before us, we set up the heavy transfer box before Makoko's cage on the previous evening. With everything in position, it occurred to us that practice might not come amiss. Keeper Reilley coaxed the mammoth



These are three of the five "play yards" on the south side of the new Great Apes House. Walls and water moats segregate the animals.

Makoko into strategic position, said "Boo!" and in he went! Doors closed, bars dropped and presently our Gorilla calmly munched a banana, safe in his box.

It was all as simple as that. Next morning, America's longest and most powerful derrick lifted the 430-pound Makoko, in his 1,230 pound crate, high over the moat at the Great Apes House and deposited its burden gently before an entrance door. Slides creaked, bars lifted and Makoko walked into his new home, to be greeted, before the barrier, by his old friends, Keepers Reilley and Quinn.

And so it went throughout that memorable day. In succession, the 306-pound Oka and Jimmy, the powerful male Chimpanzee, made the aerial journey, all without untoward incident. Andy and Sandra, the two young Orang-utans, and the White-handed Gibbon family presented no moving problems. Three small Chimpanzees born at the Yerkes Laboratories of Primate Biology at Orange Park, Florida, and lent to us on a future replacement basis, were installed directly. And finally young Sumaili, this country's only Mountain Gorilla, was carried to her new quarters in the arms of Helen Martini, her guardian since the Cordiers brought her from the Congo in 1949.

In spite of the strange surroundings, for both keepers and animals, no real settling difficulties were encountered. With familiar faces and voices about them, all the anthropoids were soon feeding well and enjoying their spacious enclosures.

So when Andy and President Osborn had completed the formalities and members and guests

flocked into the new building they saw, for the first time anywhere, representatives of all four anthropoid groups in a single building, under the best possible conditions. A darkened public space, measuring 81 by 31 feet and with the slip-proof floor gently pitched, permits full view of the seven large, brightly lighted cages. The animals are completely separated from the spectators by a partition of glass. For complete safety, the quarters of the larger apes are fronted with inconspicuous bars of the finest rolled steel, while those of the smaller animals are fronted with heavy plate glass. Heat, ventilation and humidity are fully controlled by the most modern means.

Much thought was given to the interior decor of the rooms. A final plan, developed by Harold Sterner and Albert Wein (the latter designed the "snow bank" of the Penguin House), has given a most satisfactory result. Varying levels provide welcome variety, simulated tree forms in colored concrete give continuity and concealed sleeping boards of pressed wood insure comfort. Skillful lighting, under which the animals are never in shadow, was designed by Feder.

Room-separating blank walls conceal the necessary shifting cages and provide convenient space for labels. These are made of sensitized block letters which, when activated by "black light," glow attractively in the dimness of the public space.

Outside the building and connecting with the inner rooms, are five great play-yards, the largest measuring 55 feet wide by 38 feet deep. Sheer walls of brick, each concealing a keepers' passage, and extending 10 feet above every vantage point, separate each yard from its neighbor. Water moats 14 feet across and with a maximum depth of 6 feet, lie between animals and visitors.

Because of the lateness of the season, we had thought that first excursions into the yards must be postponed until spring. However, the warm sun of October 16 presented unexpected opportunity and the doors of Makoko and Oka were opened. Both animals peered forth with caution,

(*Continued on Page* 193)

By keeping the public space dark and flooding the animal compartments with light, perfect visibility is attained. Plate glass separates the visitors from the animal space.



WILD GOOSE CHASE

A Picture Story

By HENRY D. HAMMOND

ONE morning last summer a spur-winged Goose flew over the stone wall that separates the African Plains from the Lion Island Moat. No harm in that—except that a Lion might spy the bird, jump down into the moat, and have spur-winged Goose for lunch. So a rescue was effected, and Mr. Hammond—one of our Members—took photographs of it.



1 FOR SAFETY'S SAKE THE LIONS WERE CALLED IN-DOORS AND LOCKED UP.

4 A QUICK SWOOP OF THE NET AND THE WILD GOOSE CHASE WAS OVER.



5 TRIUMPHANT AND WITH THE BIRD UNHARMED, THE KEEPER EMERGES.





2 THEN KEEPER GERBEN WENT DOWN INTO THE MOAT CARRYING A NET.



3 GERBEN HAD TO SEARCH FOR THE GOOSE IN THE WEEDS AND WATER.

6 NOW ALL'S CLEAR AND THE LIONS ARE GIVEN THEIR LIBERTY AGAIN.



News from the Conservation Foundation

Afield in the Far West, the Staff Collects First-hand Reports

AS WAS BUT FIT AND PROPER, a number of the Conservation Foundation staff took part in a back-to-the-land movement of one sort or another during the summer just passed. The President fared as far afield as anyone, visiting timberlands and lumbering operations in the Pacific Northwest, inspecting the Olympic Peninsula, and seeing first-hand the controversial boundaries of the Olympic Park and Forest. He addressed a group of industrial and business leaders in San Francisco, took part in a Conservation Conference at the University of California at Berkeley, made his annual visit to the Jackson Hole Wildlife Park and delivered a commencement address at the University of Wyoming.

Visited California Condor Refuge

Messrs. Brewer and Ordway also visited the Pacific Coast, the former traversing the white waters of the Salmon and Snake Rivers, headwaters of the Columbia system, and paying a brief visit to his camp on the Rogue River. Sam Ordway spent some time at his Santa Barbara ranch where he claims to have carried on successful experiments in the use of deer-repellent sprays on young citrus trees. He visited the last refuge of the California Condor and took part in hearings resulting in an agreement which should protect this rare bird colony. He also lectured at the Teachers' Summer Conservation Workshop at the University of California.

Inspected Packing Industry

During September—from the 10th to the 23rd—Mr. Smith made a most interesting two weeks' trip at the invitation of Armour & Company. By private plane in company with Armour officials, some fourteen editors and writers inspected the meat industry from range to slaughter house. The cruise took the group from Chicago to Idaho and return, touching many towns and cities including St. Paul, Minnesota; Fargo, North Dakota; Moorhead, Minnesota; Miles City, Montana; Sun Valley, Idaho; Elko, Nevada; Cheyenne, Wyoming, and St. Joseph, Missouri.

Teachers Took a Trip

Mr. Smith also completed plans for the New York City Teachers' Training Workshop, an inservice course for city school teachers. This well-attended course opened September 28 and one of its most interesting features was an airplane cruise over the New York City environment. The 'plane, loaned by Eastern Airlines, is believed to be the first one ever to be used for such a teaching purpose.

In the September 9 issue of *Business Week*, McGraw-Hill published a leading article on water, based partially on the Foundation's Ground Water Survey. The survey report is expected off the press in book form before the end of the year.

Erosion Survey Advanced

Advancement was made on the Soil Erosion Survey by field researcher Dr. Mark Baldwin who visited Mexico and Guatemala this summer to confer with our local advisors. Maps and descriptive pictures of the incidence of soil erosion in the United States, Canada and Mexico should be presented for publication by the end of the year.

Boy Scouts and Conservation

One of the most interesting and potentially important opportunities that have come our way has been the invitation from the Boy Scouts of America to help them in the formulation of a conservation education program. This is, of

course, one of the most highly respected groups in the nation, with a membership of some 2,500,000, and a national program that carries Scout conservation work right down to grass-roots is bound to be effective beyond description. The Scouts have always stood for conservation, but it now is proposed to become an active issue with all troops everywhere. The Hornaday Award, long sponsored by the Zoological Society, should now be more popular than ever before.

The Foundation has been voted the award of honor for its 1949 work in conservation education by the National Association of Conservation Education and Publicity.

Please Send in Those Names

SO FAR our members have sent in a fair number of names in response to the appeal for Society membership prospects included in our last *Animal Kingdom*. We are grateful to those who answered this call, but, judged on the basis of past experience, there are many, many more among us who can help in this way.

Five years ago when our active membership was only about one-quarter of what it is today, we asked for prospects' names and obtained several hundred in reply. A number of members went further and signed up their prospects, sending in checks and application forms. Some members sent us as many as thirty or more new members. These good friends of the Society were most helpful in bringing our membership up to the highest point it has ever reached.

Surely, among the many persons who have joined the Society since 1945, there are hundreds who can name the best kind of prospects among their friends. We hope they will give us this help.

Remember gift memberships too! Doubtless there must be hundreds of sons and daughters, grandchildren, nephews and nieces who would find great benefit and delight in Society membership. A membership makes an unusual present that lasts all year.

Not since the Society's earliest days, half a century ago, has the outlook been so favorable for exciting times ahead. New members now will be in not only on the development of fascinating new Park plans, but they will be able to feel themselves parts of the movement to restore the Aquarium to New York.

The building of the *new* Aquarium will be one of the most important accomplishments of the Zoological Society. It will require the active interest of many friends to make this achievement possible.

New Members of the New York Zoological Society

(Between September 1 and October 31)

Life

Mrs. Nathan Hayward, Jr.

Contributing

Mrs. Philip R. Allen
Herman F. Ball
Lawrence Bennett
Kenneth Caron
Mrs. George W. Davison
Dean S. Edmonds
Edward T. Finneran
Andrew M. Hain
Richard L. Hubbard
Miss Rosemary Kenedy
Jerome Lewine
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Mrs. Russell Lord Tarbox
Mrs. Clayton E. Turney
Miss Carlyle Vogelgesang
Dr. Gibson J. Wells
Geoffrey R. Wiener

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

Camel Has Recovered from a Fractured Jaw

On June 13 our male Bactrian Camel broke its lower jaw and Dr. Goss called upon Dr. E. P. Leonard, Orthopaedic Veterinary Surgeon and Director of the Small Animal Clinic of the New York State Veterinary College, a specialist in such matters, to insert two stainless steel pins in the jaw. The first pin was removed on August 29 and the second on October 30. As a result of this operation the compound fracture of each lower jaw has made a complete recovery. Such operative procedures are common in human beings and small domestic animals but it is believed that this is the first time such a technique has been adapted to a camel.

"Sandra" Is In Retirement Until Her Hair Growns Again

Two young Orang-utans are, if not exactly twice as interesting and entertaining as one, at least twice as much of a problem when they develop problem tendencies. A case in point involves "Andy," our young male, and "Sandra," a younger and smaller female.

Although we had hoped to rear them together, it was not possible as long as they were in the old Gorilla House, for Andy was inclined to play much too roughly and in the restricted space of one compartment there was no room for Sandra to escape from his hair-pulling, leg-pulling and biting.

Things seemed to be better when the anthropoid collection was moved to the Great Apes House, for Sandra showed herself to be the bolder and more inquisitive of the two and was able to make herself at home in the Orang-utan compartment several days before Andy found his way about. He actually seemed "impressed" by her daring investigations of the compartment; at any rate, for more than two weeks he treated her with unaccustomed gentleness.

Then the pulling and biting began again, and little by little Sandra's hair vanished—yanked out by Andy. Sandra was finally so thinly clad that it was necessary to take her off of exhibition and give her a compartment of her own in the Animal Nursery. There, under the affectionate care of Mrs. Helen Martini, she is leading a quiet and undisturbed life until she grows a new and luxuriant coat of red hair. It will not, however, be possible to put her back on exhibition in Andy's compartment in the Great Apes House—unless Andy "reforms" radically and unexpectedly.

Children's Zoo Closes —Question House, Too

Both the Children's Zoo and Question House closed for the winter months on November 12. They will reopen early in the spring.

It was an excellent season for both, with 357,301 visitors to the Children's Zoo and 44,787 at Question House.



After four summers of exhibition, our Duck-billed Platypuses are still in good health and condition. This is "Cecil," who went in-doors on November 1. Penelope went in on October 25.



Until our big Gorillas get accustomed to life out-of-doors without bars, it takes much coaxing to get them to use their "play yards." This is Oka, playing hard-to-get, and Keeper Reilley.

City's School Children Hear "Animals On Parade"

One of the Zoological Park's happiest experiences in public relations occurred this past year when staff members were called on to provide information and interviews for a series of recorded FM (Frequency Modulation) broadcasts for radio station WNYE of the Board of Education. The interviews, conducted by the radio station's personnel, were smooth and informal and at their conclusion the staff members had the feeling that for once they were given time and opportunity to recount interesting natural history and experiences without pressure to be overly dramatic and superficial.

The WNYE series of broadcasts to school classrooms began this fall and will continue until late May. Anyone in this area with an FM receiver may hear the series by tuning to 91.5 megacycles. Programs are given on Mondays at 10 A.M. and 1:15 P.M.; on Tuesdays at 11:15 A.M.; Wednesdays at 2 P.M.; Thursdays at 10:45 A.M.

Dates when the programs may be heard are: December 11, 18; January 1, 15; February 5, 12, 19, 26; March 5, 12, 19; April 2, 9, 16, 23, 30; May 7, 14, 21.

"Animals on Parade" was planned, prepared and written by Miss Fan Kissen, coordinator of radio programs for the Elementary School Division at Station WNYE. She also prepared an elaborate teaching manual to accompany the series. It contains 25 full-page illustrations furnished by the Zoological Society.

* * *

A young Rhesus Monkey was found at liberty in the Zoological Park on October 21 and was captured after a brief chase. It had apparently been hand-reared as a pet, but although announcement of the capture was made in New York City newspapers, no one has claimed it.

GREAT APES HOUSE

(*Continued from Page* 187)

obviously bewildered by their first glimpse of blue sky and open space. Oka could not be coaxed beyond the stone outside her door but Makoko soon ventured farther and made a complete inspection of the enclosure. He looked through small panels of transparent Herculite, tested doors, visibly shook a great tree section weighing tons, had his first glimpse of open water. Through it all, a silent group of spectators watched, awed by the superb grace and strength of the magnificent animal, seen for the first time with no intervening bars. And when finally he had returned to his indoor home and the slide had closed firmly behind him, an audible sigh went up. Another milestone had been passed.

"Our Plundered Planet" Published In Eleven Languages

Since its original publication in English in 1948, President Osborn's book, "Our Plundered Planet," has been printed in ten additional languages.

Editions are now available in German, French, Italian, Danish, Swedish, Finnish, Icelandic, Portuguese, Japanese and Korean, and it is probable that, because of the importance of its plea for conservation of the world's natural resources, still other language editions will appear.

"Saturday at the Zoo" Ends

The Zoo's television show, "Saturday at the Zoo," closed with the half-hour performance on Saturday, December 2, after a "run" of twenty-six weeks. This was the Zoological Park's first experience with a sustained television program and the general feeling has been that it was a valuable means of extending the boundaries of the Zoological Park to reach persons who seldom if ever have an opportunity to visit a zoo. The program has been seen over the American Broadcasting Company network as far west as Chicago.

Aquarium Tries New Type of Artificial Sea Water

Many attempts have been made in the past to create an artificial sea water for use in small and large aquaria, but none have been entirely successful. Now Curator-Aquarist Coates is experimenting with a new type of "marine" water made from ordinary fresh water, and it gives some promise of success. To test the water, an interesting collection of small, brightly-colored East and West Indian coral reef fishes has been acquired. The fishes are currently on exhibition in the Aquarium in the Lion House.

PUBLICATIONS OF INTEREST

RUBY THROAT. The Story of A Humming Bird. By Robert M. McClung. With illustrations by the author. William Morrow & Co., New York, 1950. $2.00.

Much emphasis has been placed on the development of technique in the writing of books for children but little is said regarding the necessity for accuracy in the material. There certainly is no reason why method and content should not combine to arouse the child's interest and stimulate it with truth. In "Ruby Throat" Mr. McClung, Assistant in our Department of Mammals and Birds, has achieved a happy and well-balanced result. There is adventure enough in the life of his hummingbird to satisfy the young reader and best of all, the story is based on fact. The author's drawings in color and black-and-white add much to the attractiveness of the book. L.S.C.

MENABONI'S BIRDS. By Athos and Sara Menaboni. 32 plates in color, 13 full page drawings in black and white, numerous text-figures, pp. 132—xi. Rinehart & Company, Inc., New York, 1950. $10.

This handsome volume is in no sense the conventional bird book. The text is purely and charmingly anecdotal, the only technical material being found in the rather formidable captions. The title applying to each plate is disconcertingly printed on the reverse, so that it faces the following drawing, with confusing effect. The captions of the black-and-whites are gathered together on three pages at the back of the volume.

As to Mr. Menaboni's birds, there can be no doubt that, for the most part, they are very good indeed. The reproduction of feather quality requires a special ability, with which this artist is amply blessed. Detail is meticulous, sometimes perhaps too noticeably so. Opinions as to the individual merit of the drawings will vary, of course. To this reviewer, the Hummingbirds and Wood Ducks seem especially lovely, the Hooded Warblers and Pintails something less than beautiful. The black and white drawing of Black Ducks is outstandingly attractive. The letter-press and color work are excellent and reflect credit upon the publishers. L.S.C.

THE CARE AND BREEDING OF LABORATORY ANIMALS. By 15 contributors; edited by Edmond J. Ferris. 515 pp.—xvi. Illustrated. John Wiley & Sons, New York, 1950. $8.00.

Fifteen authors have contributed to this useful and well-prepared treatise on the care of animals for laboratory use. Reptiles (including snakes, lizards, turtles and crocodilians), amphibia, fishes, chickens, opossums, drosophila and ferrets are dealt with in addition to the more common laboratory animals. A certain few chapters, such as the one dealing with dogs, are too sketchy for those totally inexperienced in caring for animals. One of the longest and most practical chapters is that on fish, by Dr. Myron Gordon, the Aquarium's Geneticist.

This work should prove valuable and be well received and widely used at all levels from secondary school biology classes to research laboratories.—L. J. G.

THE PRIVATE LIFE OF THE PROTOZOA. By Winifred Duncan. 132 pp., 14 pls. of sketches. Ronald Press Co., New York. $3.00.

This is a volume of the Humanizing Science Series edited by Jaques Cattell. There are several scientific errors. Some parts are well done, e.g., regeneration in the flatworms. Two-thirds of the book is concerned with invertebrate organisms other than Protozoa. The last sentence in the book reads: "Now, dear reader, have I interested you in Hellgramites?" R.F.N.

SONG OF THE SEASONS. By Addison Webb. 127 pp. William Morrow & Co., New York, 1950. $2.50

This is one of the excellent Morrow Junior Books. The story, sensitively told by Mr. Webb and exceptionally illustrated by Charles L. Ripper, deals with mating, parental care, "training of the young", territorial rights and other behavior patterns of several common animals (insects, fishes, amphibia, birds and mammals) at different seasons. R.F.N.

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A NEW Book

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